

## CHAPTER TWO

### THE LEGUME-FEEDING PSYLLIDS (HEMIPTERA, PSYLLOIDEA) OF THE CANARY ISLANDS, MADEIRA AND ADJACENT AREAS

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#### Abstract

A detailed survey of the legume-feeding jumping plant-lice, or psyllids (subfamily Arytaininae) in the Canary Islands and Madeira indicates a high level of endemism and diversification in this region. An additional survey in possible continental source areas provides a comparison of continental and island species diversity. The taxonomy of the genus *Arytainilla* is revised to reflect a distinct origin for the predominantly Macaronesian group. The position of this island group is clarified in relation to the mainly continental *Arytainilla sensu stricto*. One new genus and 17 new species are described. Descriptions of previously undescribed 5<sup>th</sup> instar nymphal stages for 31 species are also included. Nine of the new species are described in *Arytinnis* **gen. nov.**, four in *Arytainilla*, three in *Livilla* and one new species in *Arytaina*. In addition, 14 new combinations are proposed including the transfer of *Psylla improvisa* to *Pseudacanthopsylla*. A high degree of host specificity is typical and information is given on host plant associations, biology and geographic distribution. Separate keys for adults and nymphs are provided for *Arytinnis* **gen. nov.**, *Arytainilla* and the remaining Canary Island species.

#### 2.1 Introduction

The psyllid subfamily Arytaininae comprises 14 genera, five of which feed exclusively on genistoid legumes (Genisteeae, Leguminosae). Hodkinson and Hollis (1987) examined two of the genistoid-feeding genera, *Arytaina* and *Livilla*, but observed that the genus *Arytainilla* was ‘certainly not a monophyletic group’ and required further collecting. A survey of genistoid hosts in the Canary Islands, Madeira, Southern Iberia and North Africa has provided additional material for a revision of *Arytainilla sensu* Loginova, 1972. The predominantly Macaronesian species are here placed in a separate genus, *Arytinnis* **gen. nov.**, to reflect the monophyly of this

group and its origins as distinct from *Arytainilla sensu stricto* represented by the type species *Arytainilla delarbrei*. As defined here, *Arytainilla sensu stricto* returns to a concept closer to the original for this genus (*sensu* Ramírez Gómez, 1956) before the inclusion of the Macaronesian species by Loginova (1972). However, the present inclusion of *A. sulci*, *A. gredi* and *A. montivaga* sp. nov. in this genus is problematic, nevertheless it seems best to retain these species in *Arytainilla* until further work resolves their placement within Arytaininae.

None of the five genera of legume-feeding psyllids represented in the Canary Islands are exclusively endemic. However, all 21 Canary Island species in the four Arytaininae genera, *Arytaina*, *Arytainilla*, *Arytinnis* gen. nov. and *Livilla* are endemic, while a single *Acizzia* (*Acizziinae*) species is introduced. There are 21 species in *Arytinnis* gen. nov., 16 of which are endemic to the Canary Islands and half of these are newly described species. In addition, one *Arytinnis* species is described from Morocco. Of the remaining five non-Canarian species, two are endemic to Madeira, one to the Moroccan Anti-Atlas mountains, one to the Moroccan High Atlas mountains and one, *A. hakani*, is the only widespread species occurring throughout the western Mediterranean.

Within the Hemiptera the morphological transformation between immature and adult is particularly dramatic in the Psylloidea. The term ‘larvae’ for immature stages has been used to emphasise the absence of shared characteristics between nymph and adult, and indicates the importance of descriptions for both immature and adult stages. Previous descriptions of the last (5<sup>th</sup> instar) nymphal stage for *Arytinnis* gen. nov. have been limited to one species (*A. hakani*, Rapisarda, 1987). With the addition here of a further 19 descriptions of 5<sup>th</sup> instar nymphs, only one species remains with the nymph undescribed (*A. canariensis*). In contrast to the relative homogeneity of nymphal forms in *Arytinnis* gen. nov., differences in nymphal morphology are pronounced in the remaining *Arytainilla* species. This divergence reflects a similar heterogeneity in the adult form, perhaps indicating the greater age of this lineage and possibly extinct intermediates.

All native legume-feeding psyllids in the Canary Islands feed on hosts in the tribe Genisteeae (*Papilionoideae*, *Leguminosae*). These papilionoid legume shrubs include the common brooms and gorse, and are most diverse in the Mediterranean and North African regions. Macaronesian representatives from the Canary Islands and Madeira have clear affinities to Mediterranean taxa. However, within the islands species affiliations have been controversial, particularly in the genus *Teline* (Gibbs & Dingwall, 1972; Gibbs, 1974; Arco Aguilar, 1983, 1993). Of the 16 species currently recognized for *Teline*, 10 are endemic to the

Canary Islands, one to Madeira and five species are continental, occurring in the Mediterranean and North Africa (Gibbs & Dingwall, 1972; Talavera & Gibbs, 1999). The extensive ecological radiation of this group in the Canary Islands contrasts with other genistoid genera present in the Canaries: *Chamaecytisus* and *Genista* are each represented by a single species, while *Adenocarpus* and *Spartocytisus* exhibit limited diversification with a high and low altitude species in each genus. The Genisteae are considered to be a monophyletic tribe but the delimitation of genera has proved problematic (Polhill, 1976; Bisby, 1981; Käss & Wink, 1997). There are three generally accepted groups: a *Genista* group, a *Cytisus* group and various outliers. Of the genera that occur in the Canary Islands, *Teline* and *Retama* are in the *Genista* group, *Chamaecytisus* and *Spartocytisus* are in the *Cytisus* group while *Adenocarpus* is considered an outlier. Although some members of *Arytinnis* gen. nov. feed on hosts in *Adenocarpus* (two species), *Genista* (three species) and *Chamaecytisus* (two species); *Teline*, on which 15 species feed, is the primary host group for this genus. In the Canary Islands there has been considerable diversification of the *Teline*-feeding psyllids that reflects the diversification in the host genus.

## 2.2 Materials, methods and terminology

Field collections were made during June-July and December 1997, March-July 1998, March-May 1999 and July-August 2000. Adults and nymphs were collected by sweeping host plants with a canvas net and stored in 100% ethanol. Host plant material was examined in the field and in the laboratory for presence and placement of eggs and 1<sup>st</sup>-2<sup>nd</sup> instar nymphs.

Identifications were made from alcohol, slide mounted (method in Hodkinson & White, 1979) and capillary mounted (method in Ossiannilsson, 1992) material. Geographical and host preference ranges were determined by sampling from several different host populations and by sampling from the same populations in different years (details of hosts and host populations sampled in the Canary Islands are given in Appendices 1 & 2). Pressed plant specimens (deposited at Glasgow University Herbarium (GL) and Royal Botanic Garden Edinburgh (E)) were made of all host plants including intraspecific taxa for confirmation of host plant identification. The methods used to assess host specificity were a) the presence of nymphs – immature stages are mobile but typically sedentary, particularly in 1<sup>st</sup>-3<sup>rd</sup> instar stages, 4<sup>th</sup>-5<sup>th</sup> instars can move rapidly but are unlikely to travel far from feeding sites or to disperse from one plant to another; b) comparison of adult distribution in locations where the host plant is

isolated, with locations where the host plant grows sympatrically with other genistoid legume species. In the latter situation transient adults are frequently found on legumes other than the host or, at high densities, on non-leguminous plants. Material was collected by the author unless otherwise stated. Terminology and measurements used in some adult characters are illustrated in Figs 1 and 2 and the treatment of setal placement in nymphal descriptions and keys is indicated in Fig. 2. All other terminology and measurements follow Hodkinson & White (1979) and White & Hodkinson (1982, 1985). In the type and other material examined the host plant is only listed when the species is oligophagous on more than one host plant or when adults, as transients, were collected from hosts other than the specified host plant for that species. The following abbreviations are used to indicate institutions in which type material is deposited: The Natural History Museum, London (BMNH); Departamento de Biología Animal (Zoología), Universidad de La Laguna, Tenerife (DZUL); Naturhistorisches Museum Basel (NHMB). Other material is in the collection of the author indicated by DP and a collection number. Numbers in parenthesis after new species names will represent that species in a current molecular analysis.

Abbreviations used in the descriptions are as follows (all measurements are recorded in mm):

#### Adults

WLPT	= ratio forewing length : pterostigma length
ALHW	= ratio antennal length : head width
GCVL	= ratio genal cone length : vertex length
WLHW	= ratio forewing length : head width
VLW	= ratio vertex length : width
WLW	= ratio forewing length : width
CUR	= ratio forewing cell $cu_1$ width : height
MR	= ratio forewing cell $m_2$ width : height
RMCU	= ratio forewing wing vein $R_s$ length : vein $M+Cu_1$ length
TLFL	= ratio hind leg tibia length : femur length
TLHW	= ratio hind leg tibia length : head width
SCHW	= ratio mesoscutum width : head width
ATIB	= ratio hind leg apical tarsus length : tibia length
MTIB	= ratio hind leg metatarsus length : tibia length

- PBHW = ratio distal proboscis segment length : head width  
ATMT = ratio hind leg apical tarsus length : metatarsus length

#### Adult genitalia $\Gamma$

- MP = proctiger length  
PL = paramere length  
AEL = distal aedeagus segment length  
AEH = aedeagus hook length  
MPHW = ratio proctiger length : head width  
PLHW = ratio paramere length : head width  
MPPL = ratio proctiger length : paramere length  
AEPL = ratio distal aedeagus segment length : paramere length  
MSLH = ratio subgenital plate length : height  
AHS = ratio distal aedeagus segment length : aedeagus hook length  
PLSH = ratio paramere length : subgenital plate height

#### Adult genitalia E

- FP = proctiger length  
FSP = subgenital plate length  
RL = anal ring length  
OV = ovipositor valvulae dorsalis length  
EL = egg length  
FPHW = ratio proctiger length : head width  
FPSP = ratio proctiger length : subgenital plate length  
FPCR = ratio proctiger length : anal ring length  
OLSP = ratio ovipositor valvulae dorsalis length : subgenital plate length  
FEOL = ratio mean egg length : mean ovipositor valvulae dorsalis length

#### Nymphs

- BL = body length  
BW = body width  
WL = forewing pad length

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CPL	= caudal plate length
CPW	= caudal plate width
RW	= circumanal ring width
RL	= circumanal ring length
HW	= head width
AL	= antennal length
AL3	= length of 3 <sup>rd</sup> antennal segment
WBL	= ratio body width : length
ALHW	= ratio antennal length : head width
ALWL	= ratio antennal length : forewing pad length
WLHW	= ratio forewing pad length : head width
WCPL	= ratio caudal plate width : caudal plate length
CPRW	= ratio caudal plate width : circumanal ring width

### 2.3 Taxonomic treatment

[Figures, where appropriate, are referenced in the keys and presented at the end of the chapter. Terminology and measurements are illustrated in Figs 1 and 2]

#### 2.3.1 Key to adults of the legume-feeding genera in the Canary Islands and Madeira.

- 1 Body colour predominantly orange-brown; forewing membrane with apical, orange-brown pattern of clouds and spots, cell  $m_2$  narrow and long ( $MR < 0.37$ ) and cell  $cu_1$  narrow and high ( $CUR \leq 1.38$ ); antennae shorter than 1 mm; male paramere shorter than 0.25 mm; distal aedeagus segment ( $< 0.22$  mm) appearing jointed, apex without a hook but with a sharp point and dorsal blade; male proctiger with a pronounced basal posterior lobe and subsidiary projection, the apical portion slender; male subgenital plate elongate, length greater than 1.55 x height; female genitalia truncated, proctiger ( $< 0.5$  mm) shorter than 0.7 x head width, circumanal ring relatively long – proctiger length less than 2.6 x ring length, subgenital plate shorter than 0.3 mm; ovipositor valvulae dorsalis short ( $< 0.12$  mm) and relatively high with a slender antero-dorsal elongation at the base (Fig. 1D) .....  
..... *Acizzia* Heslop-Harrison  
[a single introduced species, *Acizzia uncatoides* (Ferris & Klyver), on *Acacia* spp.]
- Body colour predominantly green or dark brown to grey; forewing membrane either clear, or more darkly pigmented (often towards the apex), or with distinct dark brown apical banding, cell  $m_2$  broader and shorter ( $MR > 0.37$ ) and cell  $cu_1$  broader and lower ( $CUR >$

- 1.38); antennae longer than 1 mm; male paramere longer than 0.25 mm; distal aedeagus segment ( $> 0.22$  mm) either straight or curved, apex with a hook or bluntly rounded; male proctiger either not, or only gradually becoming inflated posteriorly towards the base; male subgenital plate more orbicular, length less than 1.55 x height; female genitalia longer, proctiger ( $> 0.5$  mm) greater than 0.7 x head width, circumanal ring relatively short – proctiger length greater than 2.6 x ring length, subgenital plate longer than 0.3 mm; ovipositor valvulae dorsalis relatively long ( $> 0.12$  mm) and slender, without antero-dorsal elongation at the base ..... 2
- 2 Forewing membrane with distinct pattern of dark brown transverse bands and clouds, pterostigma rudimentary, vein Rs distinctly curved upwards at the apex towards the costal margin, vein M sinuous, cell  $m_2$  almost as wide as long ( $MR > 0.8$ ), surface spinules dense ( $> 100$  per  $0.1$  mm<sup>2</sup>); genal cones longer ( $> 0.3$  mm) than the vertex; male subgenital plate dorsal posterior margin with a pair of long (more than half the length of the paramere) stout setae; metatarsal spur absent (Fig. 1K) ..... *Livilla* Curtis [a single species, *Livilla monospermae* Hodkinson, on *Retama monopserma*]
- Forewing membrane either clear or more darkly pigmented, often with darker patches in the apical cells, but without a distinct pattern, pterostigma either absent or long (about  $\frac{1}{4}$  or greater the wing length), vein Rs not, or only weakly, curving upwards at the apex towards the costal margin, vein M evenly curved, cell  $m_2$  significantly longer than wide ( $MR < 0.7$ ), surface spinules less dense ( $< 100$  per  $0.1$  mm<sup>2</sup>); genal cones shorter ( $< 0.25$  mm) than the vertex; male subgenital plate dorsal posterior margin without a pair of long, stout setae; one metatarsal spur (Figs 1I–J & L–N) ..... 3
- 3 Forewing coriaceous, yellow-brown becoming darker at the margins, cell  $r_1$  narrow with vein Rs running close to the costal margin, cell  $cu_1$  broad and low ( $CUR > 2.3$ ); hindwing costal margin straight; genal cones longer than 0.75 x vertex length; male paramere slender and sinuous, as long, or longer than 0.9 x head width; male proctiger slender, longer than 0.7 x head width; distal aedeagus segment longer than 0.45 mm, apex relatively small, less than 0.15 x segment length, and bluntly rounded without a hook; female genitalia robust, the proctiger apex arched and tip upturned; ovipositor massive, valvulae dorsalis longer ( $> 0.5$  mm) than 0.5 x subgenital plate length (Figs 1F & 3) ..... *Arytainilla* Loginova [a single species, *Arytainilla serpentina* sp. nov., on *Spartocytisus filipes*]
- Forewing not coriaceous, either clear or with darker patches in the apical cells, cell  $r_1$  relatively wide, cell  $cu_1$  relatively high ( $CUR < 2.3$ ); hindwing costal margin concave;

- genal cones shorter than 0.75 x vertex length; male paramere shorter than 0.9 x head width; male proctiger relatively broad and short, less than 0.6 x head width; distal aedeagus segment shorter than 0.45 mm, apex relatively large, greater than 0.2 x segment length, and with a shallow or well rounded hook; female genitalia more slender, the proctiger apex straight or slightly upturned; ovipositor slender, valvulae dorsalis shorter (< 0.3 mm) than 0.5 x subgenital plate length (Figs 1G–H) ..... 4
- 4 Body colour predominantly dark brown or grey (recently emerged adults may be green); forewing costal break and pterostigma absent; head not, or only weakly, deflexed downwards with genal cones in approximately the same plane as the vertex; male paramere shorter than the proctiger, length less than 0.4 x head width; distal aedeagus segment longer than 0.95 x paramere length ..... *Arytaina* Foerster
- Body colour predominantly green (mature adults sometimes develop brown colouration); forewing with costal break and long pterostigma; head deflexed downwards with genal cones directed downwards relative to the plane of the vertex; male paramere longer than the proctiger, length  $\geq 0.4$  x head width; distal aedeagus segment shorter than 0.95 x paramere length ..... *Arytinnis* gen. nov.

### 2.3.2 Key to 5<sup>th</sup> instar nymphs of the legume-feeding genera in the Canary Islands and Madeira.

- 1 Abdominal sectasetae either absent or if present, one or two pairs ..... 2
- Abdominal sectasetae three or four pairs ..... 3
- 2 Antennae with nine segments (including scape and pedicel) and with a capitate seta on 3<sup>rd</sup> and 5<sup>th</sup> segments; anterior head and ocular setae distinctly capitate; total body length less than 1.5 mm; antennae shorter than 0.7 mm, less than 1.5 x forewing pad length, or 1.2 x head width; width of caudal plate greater than 1.7 x length, and greater than 5 x anal ring width (Fig. 29D) ..... *Acizzia* Heslop-Harrison  
[a single introduced species, *Acizzia uncatoides* (Ferris & Klyver), on *Acacia* spp.]
- Antennae with seven segments (including scape and pedicel) and with simple setae only; ocular seta simple and anterior head setae simple or narrowly capitate; total body length greater than 1.5 mm; antennae longer than 0.7 mm, greater than 1.5 x forewing pad length, or 1.2 x head width; width of caudal plate less than 1.7 x length, and less than 5 x anal ring width (Figs 24B–D) ..... *Arytaina* Foerster



- 3 Distinctly capitate setae present on anterior margin of the head, and distally on 3<sup>rd</sup> and 5<sup>th</sup> antennal segments; numerous small, pale, capitate setae present dorsally on the wing pad surfaces and thorax (Fig. 24A) ..... *Livilla* Curtis  
[a single species, *Livilla monospermae* Hodkinson, on *Retama monopserma*]
- Anterior margin of the head with simple or narrowly capitate setae, antennae with simple setae only; wing pad surfaces usually without capitate setae or where present on the wing pads and thorax, long and darkly pigmented ..... 4
- 4 Forewing pad and abdomen acutely rounded apically; marginal abdominal setae (other than sectasetae) two pairs; wing pads with minute simple setae only; antennae shorter than forewing pad length, or head width; head width less than forewing pad length; forewing pad longer than 0.7 mm; caudal plate length (> 0.8 mm) greater than width (Fig. 22C) .....  
*Arytainilla* Loginova  
[a single species, *Arytainilla serpentina* sp. nov., on *Spartocytisus filipes*]
- Forewing pad and abdomen broadly rounded apically; marginal abdominal setae (other than sectasetae) one, three or four pairs; wing pads with one or more prominent setae; antennae longer than forewing pad length, or head width; head width as great or greater than forewing pad length; forewing pad shorter than 0.7 mm; caudal plate length (< 0.6 mm) less than width (Figs 25–29) ..... *Arytinnis* gen. nov.

### 2.3.3 SUBFAMILY ARYTAININAE

#### Genus *Arytainilla* Loginova

*Spartina* Heslop-Harrison, 1951: 443; 1961a: 417. Type species *Psylla spartii* Guerin, by monotypy [Homonym of *Spartina* Harris and Burrows, 1891]

*Lindbergia* Heslop-Harrison, 1951: figures 2 a, b, nomen nudum [no included species] (nec *Lindbergia* Riedel, 1958)

*Lindbergiella* Heslop-Harrison, 1961b: 509, nomen nudum [type species not designated]

*Arytaina* subgenus *Arytainilla* Ramírez Gómez, 1956: 76, nomen nudum [type species not designated]

*Alloeoneura* subgenus *Hispaniola* Ramírez Gómez, 1956: 91, in part, nomen nudum [type species not designated]

*Arytainilla* Loginova, 1972: 17; 1977: 64. Type species: *Psylla delarbrei* Puton, designated by Loginova, 1972: 17

*Adult Description:* Variable in colour, from bright green or grey-green, to yellow or dark brown; lacking distinct forewing patterns. Forewing membrane may be transparent or opaque, or more rarely coriaceous and sometimes darkly pigmented; veins uniformly pigmented, pale or mid-brown. Forewing widest in the apical third with a broadly rounded apex, or in the middle third with a more acutely rounded apex; costal break and pterostigma present, pterostigma varying from rudimentary to long, typically less than one quarter the wing length; vein Rs may be slightly curved in the middle, but not, or only weakly curved at the apex, towards the costal margin. Hindwing costal margin straight. Antennae typically short, with eight or ten segments. Head deflexed downwards with genal cones directed downwards relative to the plane of the vertex; genal cones varying from short to long. Distal proboscis segment short to mid-length. Number of basal tibial spurs variable, typically four to five ( $2/3+1+1$ ), though individuals may have as few as three; one metatarsal spur. Paramere longer or shorter than the proctiger, often slender, elongate and simple, or shorter and broader, with or without a small or more pronounced anteriorly directed hook at the apex. Female genitalia large to massive with a robust ovipositor, or smaller with a slender ovipositor.

*Nymphal Description:* Forewing pads and abdomen broadly or acutely rounded apically. Antennae with seven segments. Tergites varying from barely reduced to extensively reduced. Circumanal ring variable in shape, outer ring with a single, or multiple rows of pores; contiguous or not with the apical abdominal margin. Head and antennae with or without distinct capitate or club setae. Wing pads with or without prominent setae. Sectasetae absent or present (one to four pairs). Legs with or without capitate setae.

*Comment:* This is a heterogeneous group of 12 species. *Arytainilla sensu stricto* is a monophyletic group of 9 species that can be distinguished most notably by the large female genitalia and robust ovipositor. The three remaining species, *A. gredi*, *A. sulci* and *A. montivaga* sp. nov. are not included in this group and their correct placement within the Arytaininae is not clear. Thus, they are retained in *Arytainilla* for the present and are treated here as residual species. *Arytainilla* is a predominantly continental genus with only one species occurring in the Canary Islands. Useful biological notes for species occurring in Italy can be found in Conci, Rapisarda & Tamanini (1993, 1996).

Key to adults of *Arytainilla*.

- 1 Female ovipositor large (often with serrations or projections), valvulae dorsalis longer than 0.25 mm and greater than 0.5 x subgenital plate length, valvulae ventralis higher than valvulae dorsalis at least in part, valvulae dorsalis dorsally more or less straight (either slightly concave/convex, or bearing tooth-like processes) or markedly concave with an inflated base (Figs 1A & B) ..... 2
- Female ovipositor small (not toothed or serrated), valvulae dorsalis shorter than 0.25 mm and less than 0.5 x subgenital plate length, valvulae ventralis slender, not higher than valvulae dorsalis, valvulae dorsalis dorsally convex and wedge shaped (Fig. 1C) ..... 11
- 2 Male paramere shorter than 0.5 x head width, in lateral view with a terminal blade present laterally exterior to the apex and the sclerotized apex with a large, anteriorly directed hook; aedeagus distal segment longer than 0.9 x paramere length, with a relatively large apical hook – the length about 0.25 x segment length; male subgenital plate dorsal profile raised anteriorly with a distinct step; female proctiger apex squarely truncated; ovipositor valvulae dorsalis concave dorsally and distinctly inflated anteriorly at the base; ovipositor valvulae ventralis relatively slender, apex rounded with minute serrations that extend along the ventral margin (on *Retama*; Continental) (Fig. 1B) ..... *sulci* (Vondráček)
- Male paramere longer than 0.5 x head width, in lateral view without a terminal blade and the sclerotized apex with or without a small hook or projection; aedeagus distal segment shorter than 0.9 x paramere length, apex not developed into a hook or with a relatively small hook – the length less than 0.25 x segment length; male subgenital plate dorsal profile more or less straight or slightly curved, but without a distinct step; female proctiger apex bluntly rounded or acute; ovipositor valvulae dorsalis more or less straight dorsally (either slightly concave/convex or bearing tooth-like processes); ovipositor valvulae ventralis extremely robust, apex either round or square, ventral margin either smooth or with two small projections ..... 3
- 3 Antennal segments eight (including scape and pedicel); head wider than 0.86 mm; distal proboscis segment longer ( $\geq 0.14$  mm); male paramere (in lateral view) with lower part curvaceous, bulging rearward at the base and forward in the middle, but with the upper part straight and more or less parallel sided, interior surface with numerous stout setae on the lower part and densest on the anterior and posterior protrusions; aedeagus distal segment longer than 0.85 x paramere length; female subgenital plate ventral profile with pronounced, medial bulge (on *Cytisus*; Continental) ..... *delarbrei* (Puton)

- Antennal segments ten (including scape and pedicel); head narrower than 0.86 mm; distal proboscis segment shorter ( $< 0.14$  mm); male paramere (in lateral view) more slender, either curvaceous or straight, tapering or expanding towards the apex, interior surface either with fewer, slender setae, or with stout setae more evenly distributed; aedeagus distal segment shorter than 0.85 x paramere length; female subgenital plate ventral profile shallowly or more deeply curved, or angled medially ..... 4
- 4 Forewing coriaceous, long and narrow, length greater than 2.65 x width, with an acutely rounded apex, cell  $r_1$  narrow with vein Rs running close to the costal margin; pterostigma long, about 0.25 x wing length; genal cones long ( $> 0.16$  mm), longer than 0.75 x vertex length; male paramere and proctiger extremely long and slender – paramere ( $> 0.7$  mm) longer than 0.85 x head width, proctiger ( $> 0.5$  mm) longer than 0.7 x head width; aedeagus distal segment longer than 0.45 mm; female proctiger dorsal profile anteriorly more or less straight but with the apex arched and the tip upturned, proctiger longer than 1.12 mm; female subgenital plate ventral profile angled medially (on *Spartocytisus filipes*; La Palma) (Fig. 3) ..... *serpentina* sp. nov.
- Forewing not coriaceous and relatively short and broad, length less than 2.65 x width, with a broadly rounded apex, cell  $r_1$  not narrow; pterostigma short or rudimentary; genal cones short ( $< 0.16$  mm), equal to, or shorter than 0.75 x vertex length; male paramere and proctiger shorter – paramere ( $< 0.7$  mm) shorter than 0.85 x head width, proctiger ( $< 0.5$  mm) shorter than 0.7 x head width; aedeagus distal segment shorter than 0.45 mm; female proctiger dorsal profile anteriorly more or less straight, or slightly concave with the tip upturned, proctiger shorter than 1.12 mm; female subgenital plate ventral profile shallowly or more deeply curved ..... 5
- 5 Body colour bright green to grey green, forewing membrane clear or faintly yellow; female proctiger robust, dorsal profile more or less straight from anus to apex, apex blunt, circumanal ring length less than 0.25 x proctiger length, proctiger length not greater than 1.55 x subgenital plate length ..... 6
- Body colour yellow to brown (genitalia typically dark brown), forewing membrane with yellow-brown or brown pigmentation in part or all of the wing; female proctiger more slender, dorsal profile concave, the apex acute and upturned, circumanal ring length about 0.25 x proctiger length, proctiger longer than 1.55 x subgenital plate length ..... 8
- 6 Genal cones shorter, terminal setae often longer than the vertex; male paramere length  $\leq 1.5$  x subgenital plate height, in dorsal view lacking long stout seta on interior underside of

- apex; female genitalia smaller – female proctiger shorter than 0.85 mm, less than 1.2 x head width and less than 1.35 x subgenital plate length; ovipositor valvulae dorsalis shorter than 0.43 mm, less than 0.65 x subgenital plate length, dorsally slightly concave, the base not extending downwards to overlap the valvulae ventralis (on *Cytisus albidus*; Continental) (Fig. 4) ..... ***atlantica* sp. nov.**
- Genal cones longer, terminal setae often shorter than the vertex; male paramere longer than 1.5 x subgenital plate height, in dorsal view with long stout seta on interior underside of apex; female genitalia larger – female proctiger longer than 0.85 mm, greater than 1.2 x head width and greater than 1.35 x subgenital plate length; ovipositor valvulae dorsalis longer than 0.43 mm, greater than 0.65 x subgenital plate length, dorsally slightly convex or with distinct tooth-like processes, the base extending downwards to overlap the valvulae ventralis ..... 7
- 7 Antennal length  $\geq 1.25$  mm; male paramere longer ( $> 0.5$  mm) and broader, greater than 0.7 x head width, interior surface with numerous stout setae; male proctiger longer than 0.4 mm, greater than 0.53 x head width, but less than 0.75 x paramere length; distal aedeagus segment longer than 0.35 mm, but less than 0.7 x paramere length; female proctiger longer (0.98-1.11 mm); ovipositor valvulae dorsalis longer than 0.5 mm, with distinct dorsal tooth-like processes (on *Calicotome*; Continental) ..... *cytisi* (Puton)
- Antennae shorter than 1.25 mm; male paramere relatively short ( $< 0.5$  mm) and slender, less than 0.7 x head width, interior surface with fewer, slender setae; male proctiger shorter than 0.4 mm, less than 0.53 x head width, but greater than 0.75 x paramere length; distal aedeagus segment shorter than 0.35 mm, but greater than 0.7 x paramere length; female proctiger shorter (0.92-0.98 mm); ovipositor valvulae dorsalis shorter than 0.5 mm, without distinct dorsal tooth-like processes (on *Adenocarpus telonensis*; Continental) (Fig. 5) ..... ***telonicola* sp. nov.**
- 8 Antennae shorter than 0.96 mm,  $\leq 1.65$  x head width; male paramere (in lateral view) slightly constricted medially, expanding into a bulbous apex with the sclerotized tip displaced to the rear of the top of the paramere and with a slight posterior projection; aedeagus distal segment strongly curved, apex blunt, not developed into a hook; ovipositor valvulae ventralis with two small projections ventrally towards the apex (on *Genista aetnensis*; Continental) ..... *barbagalloi* Rapisarda
- Antennae longer than 0.96 mm,  $> 1.65$  x head width; male paramere (in lateral view) simple, parallel sided or tapering towards the apex; aedeagus distal segment more or less

- straight, apex with a shallow hook; ovipositor valvulae ventralis without ventral projections ..... 9
- 9 Forewing pterostigma rudimentary; aedeagus distal segment with a poorly developed hook; ovipositor valvulae dorsalis not, or only slightly tapering anteriorly at the base (on *Cytisus*; Continental) ..... *spartiicola* (Šulc)
- Forewing pterostigma more developed but short; aedeagus distal segment with a more developed hook; ovipositor valvulae dorsalis triangular in shape, tapering both to the apex and anteriorly (Fig. 1A) ..... 10
- 10 Male paramere longer ( $> 0.35$  mm), greater than 1.3 x subgenital plate height; aedeagus longer than 0.27 mm; female proctiger length less than 1.75 x subgenital plate length, apex more elongate; female subgenital plate ventral profile deeply curved (on *Cytisus*; Continental) ..... *spartiophila* (Foerster)
- Male paramere shorter ( $< 0.35$  mm), less than 1.3 x subgenital plate height; aedeagus shorter than 0.27 mm; female proctiger longer than 1.75 x subgenital plate length, apex less elongate; female subgenital plate ventral profile more shallowly curved (on *Cytisus*; Continental) ..... *algeriensis* Burckhardt
- 11 Surface forewing spinules relatively dense (40-60 per  $0.1\text{mm}^2$ ) with 50% or more coverage in all cells; pterostigma rudimentary; head narrower than 0.7 mm, genal cones long ( $\geq 0.11$  mm), greater than 0.65 x vertex length; male paramere (in lateral view) slender and simple with more or less parallel sides, longer than 1.3 x subgenital plate height, sclerotized apex dorsally rounded with a small, anteriorly and interiorly directed hook; aedeagus distal segment apex blunt, not developed into a hook and short ( $< 0.08$  mm), less than 0.25 x segment length; male proctiger longer than 0.5 x head width; male subgenital plate longer than 1.3 x height; female proctiger length greater than head width, dorsal profile concave with an upturned, acute apex; female subgenital plate ventral profile with a slight medial bulge; ovipositor valvulae dorsalis longer than 0.2 mm (on *Genista*; Continental) (Fig. 1C) ..... *gredi* (Ramírez Gómez)
- Surface forewing spinules sparse (less than 40 per  $0.1\text{mm}^2$ ) and either absent or reduced coverage in most cells; pterostigma well developed; head wider than 0.7 mm, genal cones short ( $\leq 0.11$  mm), less than 0.65 x vertex length; male paramere (in lateral view) broader and shorter than 1.3 x subgenital plate height, with a shallow blade on the external anterior margin, sclerotized apex dorsally flattened with, or without, a slight anterior projection; aedeagus distal segment apex with a relatively large hook ( $> 0.08$  mm), about 0.33 x

segment length; male proctiger shorter than 0.5 x head width; male subgenital plate shorter than 1.3 x height; female proctiger length less than head width, dorsal profile more or less straight from anus to apex, or with a post anal depression, apex bluntly rounded; female subgenital plate ventral profile angled medially; ovipositor valvulae dorsalis shorter than 0.2 mm (on *Adenocarpus decorticans*; Continental) (Fig. 6) ..... **montivaga sp. nov.**

Key to 5<sup>th</sup> instar nymphs of *Arytainilla*.

- 1 Abdominal sectasetae either absent or with one apical pair with indistinct medial bisection; antennae longer than 0.8 mm ..... 2
- Abdominal sectasetae three or four pairs; antennae shorter than 0.8 mm ..... 3
- 2 Abdominal sectasetae absent; tergite structure extensively reduced on the thorax and typically, not extending to the lateral margin on the abdomen; circumanal ring broadly crescent-shaped with well rounded margins; ocular seta long; marginal abdominal capitate setae four pairs; tibiae with between two to five capitate setae; forewing pad shorter than 0.7 mm, antennal length greater than 1.3 x wing pad length; caudal plate shorter than 0.5 mm (on *Adenocarpus decorticans*; Continental) (Fig. 23B) ..... **montivaga sp. nov.**
- Abdominal sectasetae one apical pair with indistinct medial bisection; tergite structure not extensively reduced on the thorax and extending to the lateral margin on the abdomen; circumanal ring narrowly crescent-shaped with lateral margins either straight or slightly concave; ocular seta absent or minute; marginal abdominal capitate setae numerous; tibiae with numerous capitate setae; forewing pad longer than 0.7 mm, antennal length less than 1.3 x wing pad length; caudal plate longer than 0.5 mm (on *Retama*; Continental) (Fig. 22B) ..... *sulci* (Vondráček)
- 3 Abdominal sectasetae three pairs ..... 4
- Abdominal sectasetae four pairs (1<sup>st</sup> pair may be reduced) ..... 6
- 4 Total body length greater than 2.2 mm, body narrower than 0.55 x length; antennae, thorax, forewing and hindwing pads with minute simple setae only; marginal abdominal setae (other than sectasetae) two pairs, simple or slightly spatulate; legs with simple setae only; caudal plate length (> 0.8 mm) greater than width (on *Spartocytisus filipes*; La Palma) (Fig. 22C) ..... **serpentina sp. nov.**
- Total body length less than 2.2 mm, body wider than 0.6 x length; head, antennae, thorax, forewing and hindwing pads with numerous, small, club-shaped setae; marginal abdominal setae (other than sectasetae) numerous small club setae, with 2-4 pairs more prominent;

- legs with numerous, small, club-shaped setae; caudal plate length ( $< 0.8$  mm) less than width ..... 5
- 5 General body colour bright green; larger species (total body length 1.6-2.11 mm); forewing pad longer than 0.6 mm; antennae longer ( $> 0.65$  mm) than forewing pad length; circum-anal ring width  $\geq 0.14$  mm (on *Calicotome*; Continental) ..... *cytisi* (Puton)
- General body colour yellow and brown; smaller species (total body length 1.3-1.6 mm); forewing pad shorter than 0.6 mm; antennae shorter ( $< 0.55$  mm) than forewing pad length; circum-anal ring narrower than 0.14 mm (on *Genista aetnensis*; Continental) .....  
..... *barbagalloi* Rapisarda
- 6 Forewing pad and abdomen apically more acute; head, thorax, abdomen, wing pads and legs with numerous small club-shaped setae ..... 7
- Forewing pad and abdomen apically broadly rounded; head, thorax, abdomen, wing pads and legs with simple or longer capitate setae ..... 8
- 7 Caudal plate wider ( $> 0.7$  mm) than 1.2 x length; circum-anal ring wider (0.14-0.19 mm) (on *Calicotome*; Continental) ..... *cytisi* (Puton)
- Caudal plate narrower ( $< 0.7$  mm) than 1.2 x length; circum-anal ring narrower (0.12-0.14 mm) (on *Adenocarpus telonensis*; Continental) (Fig. 22D) ..... ***telonicola* sp. nov.**
- 8 Forewing pad and hindwing pads with numerous capitate setae on the surface and margins; arolium pad with a relatively long petiole; circumanal ring shape narrowly crescent-shaped, with acutely rounded anterior lobes; antennae with small capitate setae distally on 3<sup>rd</sup> and 5<sup>th</sup> segments; secondary post-ocular seta narrowly or distinctly capitate; capitate setae present on the foreleg tibia (on *Cytisus albidus*; Continental) (Fig. 22A) .....  
..... ***atlantica* sp. nov.**
- Forewing and hindwing pads with capitate setae present only on the outer margins; arolium pad with a short petiole; circumanal ring shape broadly crescent-shaped, with well rounded anterior lobes; antennae without capitate setae; secondary post-ocular seta simple or indistinct; foreleg tibia without capitate setae ..... 9
- 9 Forewing pad with one prominent apical seta, or if more than five or less marginal setae, lacking distinct surface or proximal setae; circumanal outer ring not contiguous with the apical abdominal margin, outer ring with multiple rows of pores, width about 0.3-0.35 x caudal plate width; head with simple and distinctly capitate setae; primary post-ocular seta distinctly capitate; secondary post-ocular seta indistinct; dorsal abdominal pre-caudal tergites and caudal plate without prominent setae; marginal abdominal setae (other than



- sectasetae) short, distinctly capitate; marginal abdominal pleurites with capitate setae only; hind tibia with more than two capitate setae (on *Cytisus*; Continental) .....  
 ..... *spartiophila* (Förtser)  
 [also *algeriensis* Burckhardt and *spartiicola* (Šulc), the latter may be distinguished by the presence of more than one capitate seta on the forewing pad, but see Conci & Tamanini (1986)]
- Forewing pad with more than five prominent setae, and with a few distinct surface and proximal setae; circumanal outer ring contiguous with the apical abdominal margin, outer ring with a single row of pores, width less than 0.25 x caudal plate width; head setae simple; primary post-ocular seta simple or narrowly capitate; secondary post-ocular seta simple; dorsal abdominal pre-caudal prominent setae on all tergites and dorsal caudal plate prominent setae present; marginal abdominal setae (other than sectasetae) long and narrowly capitate; marginal abdominal pleurite setae paired simple or paired capitate and simple; hind tibia with one or two capitate setae (on *Genista*; Continental) (Fig. 23A) .....  
 ..... *gredi* (Ramírez Gómez)

*Arytainilla sensu stricto*

*Arytainilla delarbrei* (Puton)

*Psylla delarbrei* Puton, 1873: 21

*Arytainilla delarbrei* (Puton) Ramírez Gómez, 1956: 77

*Arytainilla delarbrei* (Puton) Loginova, 1972: 17

*Adult Colour:* Generally dark grey to brown, abdominal intersegments green; forewing membrane dirty yellow, veins uniform light brown.

*Adult Description:* Ramírez Gómez (1956)

*Nymph* Unknown

*Host plant:* *Cytisus purgans*.

*Distribution:* Continental: Moroccan High Atlas north throughout the Iberian peninsula to southern France.

*Comment:* Although recorded as having a wide geographic distribution it is uncommon. A survey of the host plant in a previously recorded location for *A. delarbrei*, in the Middle Atlas (BMNH), was not successful in finding this species. The host plant was, as in other Moroccan locations severely over grazed with no individuals gaining more than half a metre of growth above ground level. An unusual species in the atypical number of adult antennal segments.

*Material examined:* PORTUGAL: 1E, Serra da Estrela, btw Seia and Loriga, 40°15'N 7°45'W, c. 800 m, ex *Cytisus striatus*, 27.vi.1998 (DP 265.1). 1Γ, 7E, as for previous except, ex *Cytisus purgans* (DP 265.2). FRANCE: 2Γ, 2E (BMNH).

*Arytainilla spartiophila* (Foerster)

(Fig. 1A)

*Psylla spartiophila* Foerster, 1848: 75

*Psylla spartii* Guérin, 1843: 370, homonym of *Psylla spartii* Hartig, 1841

*Arytainilla spartii* (Guérin) Ramírez Gómez, 1956: 82

*Arytainilla spartiophila* (Foerster) Loginova, 1972: 17

*Adult Colour:* Brown or red-brown, to grey, with abdominal intersegment colour yellow-green; genitalia dark brown; forewing membrane pale yellow-brown, veins uniform light brown.

*Nymphal Colour:* 5<sup>th</sup> instars yellow-green with black tergites; other sclerites, wing pads, legs and terminal antennal segments darker brown.

*Adult and Nymphal Descriptions:* Ramírez Gómez (adult, 1956), Hodkinson & White (adult, 1979), White & Hodkinson (5<sup>th</sup> instar nymph, 1982), Conci & Tamanini (adult, 1986), Ossiannilsson (adult and 5<sup>th</sup> instar nymph, 1992).

*Host plant:* *Cytisus scoparius*, *C. striatus*, *C. grandiflorus* (= *Sarothamnus lusitanicus*), *Cytisus baeticus* (= *Cytisus arboreus*, *Sarothamnus baeticus*), *C. fontanesii* (= *Chronanthus biflorus*).

*Distribution:* Continental: Europe and North Africa.

*Notes:* Common and widespread on several *Cytisus* species, from the Moroccan High Atlas north throughout Europe (Conci & Tamanini, 1986). As with *Arytaina genistae* and *Artyaina adenocarpi*, this species is somewhat polyphagous on several closely related host species. *A.*

*spartiophila* is sympatric throughout much of its distribution with *Arytaina genisteae* and the asynchronous development of these two species has been well documented (Watmough, 1968).

*Biology:* Up to five nymphs were found inside the anther tubes of individual flowers of *Cytisus grandiflorus*. The majority of these were 5<sup>th</sup> instars, suggesting that eggs are laid elsewhere with subsequent migration to feed on the developing ovary.

*Comment:* This species is similar to *A. spartiicola* and *A. algeriensis* in both adult and nymphal characteristics.

*Material examined:* MOROCCO: 1Γ, 3E, Middle Atlas, rd Khénifra to Azrou, N of Mrirt, 33°15'N 5°35'W, c. 1200 m, ex *Cytisus arboreus* ssp. *baeticus*, 29.iii.1998 (DP 147). 11Γ, 9E, Middle Atlas, btw Khénifra and Azrou, S of Mrirt, 33°00'N 5°45'W, c. 1000 m, ex *Cytisus arboreus* ssp. *catalaunicus*, 29.iii.1998 (DP 148). 5Γ, 2E, Central Rif Mountains, S of Ketama, 34°55'N 4°40'W, c. 1400 m, ex *Cytisus striatus*, 22.vi.1998 (DP 251). 60Γ, 57E, 6 nymphs, High Atlas, c. 8 km S of Asni, 31°02'N 8°10'W, c. 2000 m, ex *Cytisus fontanesii*, 1.v.1999 (DP 327). SPAIN: 19Γ, 26E, 10 nymphs, Andalusia, blw Otivar, rd up Rio Verde valley, 36°47'N 3°40'W, c. 400 m, ex *Cytisus malacitanus*, 20.iii.1998 (DP 121). 11Γ, 9E, as for previous except, c. 450 m, ex *Cytisus fontanesii* (DP 123). 11Γ, 7E, 59 nymphs, Andalusia, rd Atequera to Algodonales, W of Olvera, 36°54'N 5°16'W, c. 500 m, ex *Cytisus grandiflorus*, 23.iii.1998 (DP 133). 1Γ, Andalusia, Parque Natural Sierra de Grazalema, 36°45'N 5°20'W, c. 600-700 m, ex *Cytisus arboreus* ssp. *baeticus*, 23.iii.1998 (DP 138). 4Γ, 6E, Andalusia, c. 5 km S of Ubrique, 36°37'N 5°25'W, c. 600-700 m, ex *Calicotome villosa*, 24.iii.1998 (DP 141). 1E, Andalusia, Sierra del Pedroso, E of El Pedroso, 37°50'N 5°45'W, c. 450 m, ex *Cytisus striatus*, 15.vi.1998 (DP 231). PORTUGAL: 1E, Coimbra, rd Coimbra to Viseu, at Santa Comba Dão, 40°15'N 8°15'W, c. 300 m, ex *Cytisus grandiflorus*, 26.vi.1998 (DP 261). 6Γ, 4E, Serra do Caramulo, N of Caramulo, 40°30'N 8°15'W, c. 900 m, ex *Cytisus striatus*, 26.vi.1998 (DP 263.1). 2E, as for previous except, ex *Cytisus grandiflorus* (DP 263.2). 4Γ, 13E, Serra da Estrela, btw Seia and Loriga, 40°15'N 7°45'W, c. 800 m, ex *Cytisus striatus*, 27.vi.1998 (DP 265.1). 2Γ, 5E, as for previous except, ex *Cytisus purgans* (DP 265.2). 1Γ, 5E, 1 nymph, as for previous except, ex *Cytisus striatus* (DP 266.2).

*Arytainilla spartiicola* (Šulc)

*Psylla spartiicola* Šulc, 1907: 5

*Arytainilla spartiicola* (Šulc) Loginova, 1972: 17

*Adult Colour:* Red-brown with darker brown markings; genitalia dark brown; forewing membrane distally yellow-brown, veins uniform light brown.

*Nymphal Colour:* Pale green with brown sclerites; antennae and legs darker brown.

*Adult and Nymphal Descriptions:* Šulc (adult, 1907), Conci & Tamanini (adult and 5<sup>th</sup> instar nymph, 1986).

*Host plant:* *Cytisus scoparius*, *C. decumbens*.

*Distribution:* Continental: France, Germany, Italy and Switzerland (Burckhardt, 1983).

*Comment:* An uncommon species similar in adult and nymphal characteristics to *A. spartiophila*.

No material was examined and the diagnostic characters used in the keys were extracted from descriptions in Conci & Tamanini (1986).

*Arytainilla algeriensis* Burckhardt

*Arytainilla algeriensis* Burckhardt, 1989a: 406

*Adult Colour:* Brown or red-brown, to grey; genitalia dark brown; forewing cells with faint brown patches, veins uniform mid-brown.

*Adult Description:* Burckhardt (1989a).

*Nymph* Undescribed, 5<sup>th</sup> instars examined were very similar to *A. spartiophila*.

*Host plant:* *Cytisus baeticus* (= *Cytisus arboreus*, *Sarothamnus baeticus*)

*Distribution:* Continental: Algeria and Morocco.

*Comment:* A relatively uncommon species.

*Material examined:* MOROCCO: 5Γ, 4E, 14 nymphs, Col de Jerada, 45 km S of Oujda, c. 1150 m, ex *Cytisus baeticus*, 23.iv.1992 (BMNH).

*Arytainilla barbaggioi* Rapisarda

*Arytainilla barbaggioi* Rapisarda, 1989: 24

*Adult Colour:* Cream or yellow with brown markings, genitalia dark brown; forewing membrane yellow-brown, veins uniform light brown.

*Nymphal Colour:* Cream to yellow with brown sclerites; terminal antennal segments darker brown.

*Adult and Nymphal Descriptions:* Rapisarda (adult and 1<sup>st</sup>-5<sup>th</sup> instar nymphs, 1989).

*Host plant:* *Genista aetnensis*.

*Distribution:* Continental: Italy.

*Comment:* Known only from the island of Sicily where it is locally common. The adult form of this species shares characteristics, particularly in the female genitalia, with *A. spartiophila*; although it is unique in the presence of ventral tooth-like processes on the ovipositor. The nymph however, is more similar to *A. cytisi* and *A. telonensis* sp. nov. in body shape and chaetotaxy.

*Material examined:* Paratypes (slide mounted), ITALY. SICILY: 1♂, 3E, Catania, c. 15 km SW of Rondazzo, c. 900 m, 1.vi.1979 (BMNH). 2♂, 6 nymphs, Catania, c. 15 km E of Rondazzo, c. 550 m, 3.vi.1979 (BMNH). 1♂, 2E, Catania, c. 2 km NE of Nicolosi on Mt Etna, c. 700 m, 4.vi.1979 (BMNH).

*Arytainilla cytisi* (Puton)

*Psylla cytisi* Puton, 1876: 284

*Arytainilla cytisi* (Puton) Ramírez Gómez, 1956: 79

*Arytainilla cytisi* (Puton) Loginova, 1972: 17

*Adult Colour:* Bright green, sometimes with darker abdomens; forewing membrane clear or faintly yellow, veins uniformly pale or light brown.

*Nymphal Colour:* 1<sup>st</sup>-3<sup>rd</sup> instars orange with or without black tergites, 5<sup>th</sup> instars bright green to yellow-green; sclerites, wing pads, legs and antennae yellow-brown; terminal antennal segment darker brown.

*Adult and Nymphal Descriptions:* Šulc (adult, 1911), Rapisarda (adult and 1<sup>st</sup>-5<sup>th</sup> instar nymphs, 1990, 1991).

*Host plant:* *Calicotome spinosa*, *C. villosa*.

*Distribution:* Continental: Widespread from the Moroccan Middle Atlas and Algeria north throughout southern Europe and the eastern Mediterranean (Halperin, Hodkinson & Burckhardt, 1988; Burckhardt & Önuçar, 1993; Conci *et al.*, 1993; Zeidan-Gèze & Burckhardt, 1998).

*Biology:* Large nymphs (4<sup>th</sup>-5<sup>th</sup> instars) were found under the bracts of floral buds (see also Rapisarda, 1990).

*Comment:* This species is most similar to *A. telonicola* sp. nov. in both adult and nymphal characteristics, but it is unique in the presence of dorsal tooth-like processes on the ovipositor.

*Material examined:* MOROCCO: 11 nymphs, Middle Atlas, nr Ifrane, 33°25'N 5°10'W, c. 1800 m, 31.iii.1999 (DP 316). 1Γ, 1E, 18 nymphs, Taza, c. 5 km S of Taza, Jbel Tazzeka, rd to Bab-Bou-Idir, 33°51'N 4°00'W, c. 1100 m, 31.iii.1999 (DP 317). 5Γ, 1E, 33 nymphs, Rif Mountains, rd Aknoul to Taza, c. 15 km N of Taza, 34°20'N 3°58'W, c. 800 m, 1.iv.1999 (DP 319). SPAIN: 1E, 11 nymphs, Gerona, 3 km from La Bisbal on Calonge rd, 1.vi.1975 (BMNH). 1Γ, as for previous except, 14.vi.1976 (BMNH). ITALY. SICILY: 1Γ, 1E, Messina, c. 5 km S of San Fratello, 650 m, 31.v.1979 (BMNH).

***Arytainilla serpentina* sp. nov. (1)**

(Figs 3, 22C, 1F & 1I)

*Adult*

*Colour:* Abdomen and head bright green or yellow-green, thorax, genital cones and legs yellow; forewing membrane yellow-brown, becoming darker brown apically, veins uniformly pale.

*Structure:* Forewing coriaceous and narrow, margins more or less parallel or slightly wider in the middle third, with an acutely rounded apex; cells cu<sub>1</sub> and m<sub>2</sub> relatively broad and low and cell r<sub>1</sub> narrow with vein Rs running close to the costal margin; pterostigma well developed, up to one quarter the wing length; surface forewing spinules present in all cells but reduced in cell c+sc; distribution of spinules non-uniform, dense: 60-100 per 0.1mm<sup>2</sup>; apical spines in wing

cells  $cu_1$ ,  $m_1$  and  $m_2$  but absent or occasionally few present in cell  $r_2$ . Antennae relatively short, with ten segments; genal cones long, commencing dorsally from more or less the same level as the vertex, terminal setae shorter than the vertex. Paramere long, in lateral view slender and simple, tapering towards the apex, sclerotized apex dorsally rounded with small, anteriorly and interiorly directed hook, in dorsal view contiguous anteriorly and rounded with an acute point; paramere longer than the proctiger; proctiger not inflated posteriorly towards the base; aedeagus distal segment bluntly rounded, not developed into a hook; male subgenital plate dorsal profile more or less straight and horizontal. Female proctiger dorsal profile anteriorly, more or less straight but the apex is darkly pigmented and arched with an upturned bluntly rounded tip; subgenital plate ventral profile angled medially; ovipositor valvulae ventralis robust, apex rounded and minutely serrated; height of valvulae dorsalis less than valvulae ventralis, dorsal margin more or less straight or slightly convex. Egg slender with stout pedicel at the base.

*Adult measurements and ratios:* (3 $\Gamma$ , 4E) total length:  $\Gamma$  3.24-3.56, E 3.64-3.88; forewing:  $\Gamma$  length 2.6-2.7 width 0.91-0.99, E length 2.96-3.19 width 1.01-1.1; pterostigma length  $\Gamma$  0.58-0.67, E 0.66-0.8; hindwing length  $\Gamma$  2.15-2.25, E 2.48-2.68; head width:  $\Gamma$  0.76-0.8, E 0.8-0.85; antennal length: 1.3-1.53; genal cone length: 0.18-0.2; distal proboscis segment length: 0.09-0.1. WLPT: 3.7-4.79; ALHW: 1.7-1.87; GCVL: 0.78-0.91; WLHW: 3.35-3.89; VLW: 0.43-0.49; WLW: 2.71-2.93; CUR: 2.33-2.71; MR: 0.47-0.69; RMCU: 5.96-8.26; TLFL: 1.02-1.09; TLHW: 0.63-0.71; SCHW: 0.85-0.94; ATIB: 0.33-0.37; MTIB: 0.29-0.33; PBHW: 0.12-0.13; ATMT: 1.06-1.19. *Adult genitalia*  $\Gamma$ : MP: 0.56-0.6; PL: 0.72-0.74; AEL: 0.5-0.51; AEH: 0.06-0.07. MPHW: 0.73-0.76; PLHW: 0.9-0.96; MPPL: 0.77-0.81; AEPL: 0.68-0.71; MSLH: 1.24-1.27; AHS: 0.13; PLSH: 1.74-1.76. E: FP: 1.13-1.28; FSP: 0.96-0.99; RL: 0.23-0.25; OV: 0.54; EL: 0.2-0.28. FPHW: 1.38-1.56; FPSP: 1.18-1.29; FPCR: 4.71-5.12; OLSP: 0.55-0.56; FEOL: 0.44.

### *Nymph*

*Colour:* 5<sup>th</sup> instars bright green with thorax and head more yellow, wing pads and ventral abdomen pale orange, anal ring pale grey; terminal antennal segments darker brown.

*Structure:* Forewing pads and abdomen acute apically. Tergites extensively reduced on the thorax, typically not, or only posteriorly extending to the lateral margin on the abdomen.

Arolium pad long, broadly expanded apically, with a distinct medial groove and short petiole.

Circumanal ring broadly crescent-shaped with well rounded anterior lobes, outer ring not contiguous with the apical abdominal margin and with a single row of pores.

*5<sup>th</sup> instar measurements and ratios:* (specimens 4) BL: 2.3-2.63; BW: 1.23-1.3; WL: 0.81-0.85; CPL: 0.84-0.87; CPW: 0.75-0.85; RW: 0.18-0.18; RL: 0.09-0.1; HW: 0.72-0.76; AL: 0.65-0.69; AL3: 0.15-0.16. WBL: 0.47-0.54; ALHW: 0.9-0.91; ALWL: 0.8-0.84; WLHW: 1.11-1.13; WCPL: 0.89-0.99; CPRW: 4.17-4.72.

*5<sup>th</sup> instar chaetotaxy:* Head setae simple (max length at anterior margin 0.05-0.06); antennal setae simple; ocular seta simple, small (max length 0.01); primary post-ocular seta simple or slightly spathulate (max length 0.07); secondary post-ocular seta indistinct. Dorsal thoracic setae very short simple (max length 0.02). Prominent wing pad setae absent; forewing and hindwing pads with minute simple setae only. Dorsal abdominal prominent pre-caudal and caudal plate setae absent (only minute simple); sectasetae three pairs; marginal abdominal setae (other than sectasetae) two pairs, simple, or slightly spathulate (max length 0.07-0.09); pleurite setae paired simple. Legs with simple setae only (max length 0.04).

*Host plant:* *Spartocytisus filipes*.

*Distribution:* Canary Islands: La Palma.

*Notes:* This is the only representative of *Arytainilla sensu stricto* in the Canary Islands. It is sympatric with *Arytaina vittata* sp. nov., but unlike the latter species it is restricted to the laurisilva habitat of the host, and in these locations on La Palma it was found to be more common than *A. vittata* sp. nov.

*Etymology:* Named for the long and sinuous male paramere.

*Comment:* This species is unique within *Arytainilla* in the narrow, coriaceous forewing and the shape of the genitalia, particularly in the female.

*Type material:* Holotype ♂ (slide mounted), CANARY ISLANDS. LA PALMA: NE, from El Granel to Barlovento and Roque Faro, 200-500 m, 19.v.1998 (BMNH). Paratypes 1♂, 2♀, 4 nymphs, as for holotype (BMNH). 1♂, 1♀, nr Los Galguitos, Barranco de la Fuente, 28°46'N 17°46'W, 350 m, 17.v.1998 (DZUL). 2♂, 1♀, as for previous (NHMB).

*Other material examined:* CANARY ISLANDS. LA PALMA: 7♂, 2♀, nr Los Galguitos, Barranco de la Fuente, 28°46'N 17°46'W, 350 m, 17.v.1998 (DP 191). 10♂, 6♀, as for holotype (DP 198).



*Arytainilla atlantica* sp. nov. (2)

(Figs 4 &amp; 22A)

*Adult*

*Colour:* Pale grey-green to blue-green, head, thorax and legs yellow or orange; forewing membrane clear or faintly yellow, veins uniform light brown.

*Structure:* Forewing widest in the middle third with more acutely rounded apex; pterostigma less than one quarter the wing length; surface forewing spinules present in all cells, but reduced in one or more cells; distribution of spinules non-uniform, density medium: 40-60 per 0.1mm<sup>2</sup>; apical spines in wing cells cu<sub>1</sub>, m<sub>1</sub> and m<sub>2</sub>, but absent, or occasionally few present in cell r<sub>2</sub>.

Antennae short, with ten segments; genal cones very short, commencing ventrally relative to the vertex, with a distinct depression between the vertex and the genal cones, terminal setae as long as, or typically longer than the vertex. Paramere mid-length, in lateral view slender, simple, with sides tapering towards the apex, sclerotized apex dorsally rounded with small, anteriorly and interiorly directed hook, in dorsal view contiguous anteriorly, with inner margin straight edged; paramere longer than the proctiger; proctiger not inflated posteriorly towards the base; aedeagus distal segment with a shallow hook, tip of aedeagus hook acute; male subgenital plate dorsal profile more or less straight and horizontal. Female proctiger dorsal profile more or less straight from anus to apex, apex bluntly rounded; subgenital plate ventral profile shallowly curved, without a medial bulge; ovipositor valvulae ventralis robust, apex stepped with square tip; height of valvulae dorsalis less than valvulae ventralis, dorsal margin more or less straight or slightly concave.

*Adult measurements and ratios:* (3♂, 3♀) total length: ♂ 2.28-2.6, ♀ 2.56-2.92; forewing: ♂ length 1.76-1.9 width 0.72-0.76, ♀ length 2.1-2.26 width 0.87-0.93; pterostigma length ♂ 0.25-0.3, ♀ 0.3-0.35; hindwing length ♂ 1.4-1.53, ♀ 1.68-1.8; head width: ♂ 0.64-0.66, ♀ 0.68-0.7; antennal length: 0.99-1.16; genal cone length: 0.06-0.1; distal proboscis segment length: 0.1-0.11. WLPT: 6-7.6; ALHW: 1.55-1.81; GCVL: 0.3-0.53; WLHW: 2.75-3.23; VLW: 0.45-0.53; WLW: 2.41-2.52; CUR: 1.84-2.05; MR: 0.46-0.57; RMCU: 4.95-6.74; TLFL: 1.09-1.2; TLHW: 0.69-0.74; SCHW: 0.78-0.87; ATIB: 0.28-0.3; MTIB: 0.27-0.3; PBHW: 0.14-0.16; ATMT: 1-1.08. *Adult genitalia* ♂: MP: 0.38-0.41; PL: 0.5-0.51; AEL: 0.35-0.36; AEH: 0.07-0.09. MPHW: 0.59-0.62; PLHW: 0.77-0.78; MPPL: 0.76-0.8; AEPL: 0.69-0.72; MSLH: 1.21-1.26; AHS: 0.22-0.23; PLSH: 1.47-1.52. ♀: FP: 0.76-0.82; FSP: 0.62-0.64; RL: 0.16-0.18; OV:

0.39-0.41; EL: 0.19-0.23. FPHW: 1.09-1.17; FPSP: 1.23-1.28; FPCR: 4.33-5.13; OLSP: 0.62-0.64; FEOL: 0.53.

### *Nymph*

*Colour:* 1<sup>st</sup>-3<sup>rd</sup> instars orange or red, 4<sup>th</sup>-5<sup>th</sup> instars pale grey-green or yellow with pale orange wing pads and thorax; sclerites, wing pads, legs and terminal antennal segments usually darker brown.

*Structure:* Forewing pads and abdomen broadly rounded apically. Tergites extensively reduced on the thorax, typically not extending to the lateral margin on the abdomen. Arolium pad long, broadly expanded apically with a slight medial groove and long petiole. Circumanal ring narrowly crescent-shaped with acutely rounded anterior lobes, outer ring not contiguous with the apical abdominal margin and with a single row of pores.

*5<sup>th</sup> instar measurements and ratios:* (specimens 8) BL: 1.43-1.7; BW: 0.88-1.1; WL: 0.44-0.61; CPL: 0.44-0.55; CPW: 0.67-0.81; RW: 0.14-0.17; RL: 0.09-0.11; HW: 0.55-0.63; AL: 0.49-0.62; AL3: 0.1-0.15. WBL: 0.59-0.66; ALHW: 0.86-1.09; ALWL: 0.98-1.15; WLHW: 0.77-1.05; WCPL: 1.29-1.55; CPRW: 4.18-5.06.

*5<sup>th</sup> instar chaetotaxy:* Head setae simple and narrowly capitate (both present on anterior margin) (max length at anterior margin 0.09-0.1); antennal setae simple and capitate (small capitate present distally on 3<sup>rd</sup> and 5<sup>th</sup> segments); ocular seta simple, small, inconspicuous (max length 0.03-0.05); primary post-ocular seta distinctly capitate (max length 0.06-0.07); secondary post-ocular seta distinctly or narrowly capitate, rarely simple (max length 0.04-0.06). Dorsal thoracic setae short simple and capitate or rod (max length 0.03-0.04). Prominent wing pad setae max length 0.08-0.09; forewing and hindwing pads with capitate and minute simple setae; forewing pad prominent setae 8-9, distinctly capitate, surface and marginal (larger marginal, few smaller scattered on surface), proximal seta typically present, occasionally reduced or absent, narrowly or distinctly capitate; hindwing pad prominent setae 2-3, distinctly capitate, surface and marginal (larger apical, few smaller scattered on surface), proximal seta absent or if present, distinctly or narrowly capitate; small capitate and simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on all tergites, short simple and capitate (max length 0.05-0.06), prominent caudal plate setae present, 15-21 larger, with the most posterior centrally placed, distinctly capitate; sectasetae four pairs; marginal abdominal setae (other than sectasetae) four pairs, distinctly capitate (max length 0.1-0.12); pleurite setae paired capitate and simple or capitate only (anterior pleurites with three

capitate). Legs with capitate setae present (max length 0.06-0.08); capitate foreleg setae present on femur and tibia, on the tibia 1-3 (1 proximal, 1-2 distal); capitate middle leg setae present on femur and tibia, on the tibia 3-5 (1 larger proximally and distally); capitate hind leg setae present on femur and tibia, on the tibia 5-6 (1 larger proximally and distally).

*Host plant:* *Cytisus albidus* (= *Chamaecytisus mollis*).

*Distribution:* Continental: Locally widespread in central Morocco, occurring on the lower slopes of the High Atlas and along the Atlantic coast.

*Notes:* It is typically sympatric with *Livilla blandula*, but probably developing earlier than the latter species, being both present and more common on the host in March, but absent from a collection made in June.

*Biology:* Nymphs (2<sup>nd</sup>-5<sup>th</sup> instars) were observed on leaf buds.

*Etymology:* Named for the geographic distribution in the lowland Atlas mountains and the Atlantic coast of Morocco.

*Comment:* The adult form is generally similar to *A. cytisi* and *A. telonicola* sp. nov., but the 5<sup>th</sup> instar nymph in body shape and chaetotaxy, is more similar to a *Livilla*-type.

*Type material:* Holotype  $\Gamma$  (slide mounted), MOROCCO: Atlantic Coast, c. 15 km E of Azemmour, 33°12'N 8°18'W, c. 100 m, 2.iii.1999 (BMNH). Paratypes 3 $\Gamma$ , 4E, 10 nymphs, as for holotype (BMNH). 3 $\Gamma$ , 3E, as for holotype (NHMB). 6 nymphs, Atlantic Coast, c. 35 km S of Essaouira, just N of Smimou, 31°08'N 9°42'W, c. 100 m, 22.iii.1999 (BMNH). 8 nymphs, as for previous (NHMB).

*Other material examined:* MOROCCO: 15 $\Gamma$ , 29E, 3 nymphs, as for holotype (DP 296). 1E, 2 nymphs, Atlantic Coast, c. 10 km SE of Essaouira, 31°31'N 9°37'W, c. 100 m, 22.iii.1999 (DP 298). 11 $\Gamma$ , 10E, 19 nymphs, Atlantic Coast, c. 35 km S of Essaouira, just N of Smimou, 31°08'N 9°42'W, c. 100 m, 22.iii.1999 (DP 300). 1E, Atlantic Coast, Jbel Amsittene, c. 6 km on rd to Sebt-des-Ait-Daoud, 31°10'N 9°38'W, c. 850 m, 29.iv.1999 (DP 322). 28 $\Gamma$ , 13E, 1 nymph, High Atlas, c. 10 km N of Asni, 31°15'N 7°58'W, c. 1800 m, 1.v.1999 (DP 326). 1E, High Atlas, S of Tizi n' Test, 30°45'N 8°30'W, c. 1500 m, 2.v.1999 (DP 330).

*Arytainilla telonicola* sp. nov. (3)

(Figs 5 &amp; 22D)

*Adult*

*Colour:* Bright green to yellow-green, genal cones and legs blue-green, head and thorax ochre; forewing membrane clear or faintly yellow, veins uniform light brown.

*Structure:* Forewing widest in the apical third with a broadly rounded apex; pterostigma less than one quarter the wing length; surface forewing spinules typically present in all cells but reduced in one or more cells, occasionally absent or few in cells  $cu_1$ ,  $m_2$  and  $c+sc$ ; distribution of spinules both non-uniform and uniform, medium density: 40-60 per  $0.1\text{mm}^2$ ; apical spines in wing cells  $cu_1$ ,  $m_1$  and  $m_2$ , but absent, or occasionally few present in cell  $r_2$ . Antennae short, with ten segments; genal cones short, commencing ventrally relative to the vertex, with a distinct depression between the vertex and the genal cones, terminal setae typically shorter than the vertex, occasionally as long. Paramere mid-length, in lateral view slender, simple, tapering towards the apex, sclerotized apex dorsally rounded with small anteriorly and interiorly directed hook, in dorsal view contiguous anteriorly, with inner margin straight edged; paramere longer than the proctiger; proctiger slightly inflated posteriorly towards the base; aedeagus distal segment with a flattened, shallow hook, tip of aedeagus hook blunt; male subgenital dorsal profile more or less straight and horizontal. Female proctiger dorsal profile more or less straight from anus to apex, apex bluntly rounded; subgenital plate ventral profile shallowly curved, or slightly angled medially; ovipositor valvulae ventralis robust, apex stepped with square tip; height of valvulae dorsalis less than valvulae ventralis, dorsal margin more or less straight or slightly convex.

*Adult measurements and ratios:* (4 $\Gamma$ , 4E) total length:  $\Gamma$  2.28-2.6, E 2.76-3; forewing:  $\Gamma$  length 1.88-2 width 0.78-0.9, E length 2.28-2.4 width 0.93-1.01; pterostigma length  $\Gamma$  0.28-0.35, E 0.3-0.42; hindwing length  $\Gamma$  1.5-1.6, E 1.85-1.9; head width:  $\Gamma$  0.68-0.7, E 0.72-0.77; antennal length: 1.12-1.22; genal cone length: 0.09-0.12; distal proboscis segment length: 0.11-0.12. WLPT: 5.55-8; ALHW: 1.49-1.74; GCVL: 0.47-0.6; WLHW: 2.76-3.24; VLW: 0.42-0.51; WLW: 2.22-2.51; CUR: 1.83-2; MR: 0.51-0.63; RMCU: 4.12-6.5; TLFL: 1.13-1.23; TLHW: 0.72-0.78; SCHW: 0.79-0.88; ATIB: 0.26-0.31; MTIB: 0.26-0.29; PBHW: 0.15-0.16; ATMT: 1-1.07. *Adult genitalia*  $\Gamma$ : MP: 0.34-0.35; PL: 0.43-0.44; AEL: 0.32-0.34; AEH: 0.06-0.08. MPHW: 0.5-0.51; PLHW: 0.63-0.65; MPPL: 0.79-0.81; AEPL: 0.73-0.77; MSLH: 1.26-1.35;

AHS: 0.21-0.22; PLSH: 1.63-1.65. E: FP: 0.92-0.98; FSP: 0.63-0.7; RL: 0.15-0.2; OV: 0.45-0.49; EL: 0.19-0.23. FPHW: 1.23-1.32; FPSP: 1.4-1.51; FPCR: 4.75-6.13; OLSP: 0.68-0.73; FEOL: 0.45.

### *Nymph*

*Colour:* 4<sup>th</sup>-5<sup>th</sup> instars bright blue-green to yellow-green; terminal antennal segment darker brown.

*Structure:* Forewing pads and abdomen apically acute. Tergite structure extensively reduced on the thorax, typically not, or only posteriorly extending to the lateral margin on the abdomen. Arolium pad short, expanded apically with slight medial groove and fairly short petiole. Circumanal ring narrowly crescent-shaped with acutely rounded anterior lobes, outer ring not contiguous with the apical abdominal margin and with a single row of pores.

*5<sup>th</sup> instar measurements and ratios:* (specimens 3) BL: 1.75-1.78; BW: 1-1.13; WL: 0.63-0.66; CPL: 0.57-0.62; CPW: 0.62-0.68; RW: 0.12-0.14; RL: 0.08-0.09; HW: 0.62-0.68; AL: 0.7-0.75; AL3: 0.16-0.18. WBL: 0.53-0.63; ALHW: 1.09-1.15; ALWL: 1.06-1.19; WLHW: 0.93-1.03; WCPL: 1.03-1.12; CPRW: 4.43-5.33.

*5<sup>th</sup> instar chaetotaxy:* Head setae simple and club-shaped (max length at anterior margin 0.07-0.08); antennal setae simple and club-shaped (small club setae on 1<sup>st</sup> and 2<sup>nd</sup> segments and occasionally present distally on 3<sup>rd</sup>); ocular seta small rod (max length 0.01-0.02); primary post-ocular seta club-shaped (max length 0.03-0.04); secondary post-ocular seta indistinct. Dorsal thoracic setae short club-shaped (max length 0.02). Prominent wing pad setae max length 0.03-0.04; forewing and hindwing pads with club-shaped setae, each with one prominent seta apically and with numerous small club-shaped setae on the wing pad surfaces, proximal setae indistinct. Dorsal abdominal prominent pre-caudal setae present on all tergites, short club-shaped (max length 0.02), prominent caudal plate setae present, one club-shaped positioned centrally and posteriorly with numerous smaller club setae; sectasetae four pairs (1<sup>st</sup> reduced); marginal abdominal setae (other than sectasetae) four pairs (1<sup>st</sup> and 2<sup>nd</sup> reduced), club-shaped (max length 0.06-0.07); pleurite setae paired club and simple, or club only (anterior pleurites with three club setae). Legs with numerous small, club-shaped setae on the dorsal surface of femora and tibiae (max length 0.03-0.04).

*Host plant:* *Adenocarpus telonensis*.

*Distribution:* Continental: Spain, southern Andalusia.

*Notes:* Occurs sympatrically with *Arytaina adenocarpi*. *A. telonicola* sp. nov. appears to develop earlier than *Arytaina adenocarpi* judging from the greater abundance, particularly of nymphs, of this species in March and absence from collections made in June, when *Arytaina adenocarpi* was abundant.

*Etymology:* Named for the host plant.

*Comment:* This species is most similar to *A. cytisi* in both adult and nymphal characteristics, but notably lacks the dorsal tooth-like processes on the ovipositor of *A. cytisi*.

*Type material:* Holotype ♂ (slide mounted), SPAIN: Andalusia, N of Ronda on rd to Algodonales, S tip of Lake Zahara, 36°50'N 5°20'W, c. 500 m, 23.iii.1998 (BMNH). Paratypes 1♂, 2♀, as for holotype (BMNH). 1♂, as for holotype (NHMB). 2♂, 2♀, Andalusia, Parque Natural Sierra de Grazalema, 36°45'N 5°20'W, c. 600-700 m, 23.iii.1998 (BMNH). 1♂, 2♀, as for previous (NHMB). 5 nymphs, as for previous except, 36°45'N 5°18'W (BMNH). 4 nymphs, as for previous (NHMB).

*Other material examined:* SPAIN: 45♂, 25♀, as for holotype (DP 134). 1♂, 6♀, 31 nymphs, Andalusia, Parque Natural Sierra de Grazalema, 36°45'N 5°18'W, c. 600-700 m, 23.iii.1998 (DP 135). 8♂, 7♀, 32 nymphs, as for previous (DP 136). 19♂, 30♀, 61 nymphs, as for previous except, 36°45'N 5°20'W (DP 137). 6♂, 8♀, 1 nymph, Andalusia, c. 5 km S of Ubrique, 36°37'N 5°25'W, c. 600-700 m, 24.iii.1998 (DP 140).

#### *Arytainilla* residual species

#### *Arytainilla gredi* (Ramírez Gómez)

(Figs 1C & 23A)

*Alloeoneura* (subgenus *Hispaniola*) *gredi* Ramírez Gómez, 1956: 92

*Arytainilla gredi* (Ramírez Gómez) Hodkinson & Hollis, 1987: 42

*Adult Colour:* Yellow-green to yellow-brown, genitalia darker brown; forewing membrane dirty yellow, veins uniform light brown.

*Adult Description:* Ramírez Gómez (1956)

*Nymph*

*Colour:* 5<sup>th</sup> instars with sclerites, wing pads, legs and terminal antennal segments darker brown.

*Structure:* Forewing pads and abdomen broadly rounded apically. Tergites extensively reduced on the thorax, typically not extending to the lateral margin on the abdomen. Arolium pad short, expanded apically, without medial groove and with a short petiole. Circumanal ring broadly crescent-shaped with well rounded anterior lobes, outer ring contiguous with the apical abdominal margin and with a single row of pores.

*5<sup>th</sup> instar measurements and ratios:* (specimens 6) BL: 1.65-1.85; BW: 1.05-1.2; WL: 0.56-0.62; CPL: 0.45-0.53; CPW: 0.87-0.95; RW: 0.19-0.23; RL: 0.1-0.12; HW: 0.58-0.69; AL: 0.63-0.71; AL3: 0.15-0.17. WBL: 0.63-0.71; ALHW: 0.97-1.18; ALWL: 1.11-1.16; WLHW: 0.86-1.02; WCPL: 1.79-1.93; CPRW: 4.13-4.79.

*5<sup>th</sup> instar chaetotaxy:* Head setae simple (max length at anterior margin 0.08-0.09); antennal setae simple; ocular seta simple, inconspicuous (max length 0.03); primary post-ocular seta simple or narrowly capitate (max length 0.08-0.11); secondary post-ocular seta simple (max length 0.04-0.07). Dorsal thoracic setae short and long simple (max length 0.05-0.06). Prominent wing pad setae max length 0.1-0.11; forewing and hindwing pads with simple and capitate setae; forewing pad with 10 prominent marginal setae, narrowly or distinctly capitate; hindwing pad prominent setae 2-4, distinctly capitate, marginal (2 apical and 0-2 on the outer margin, occasionally few more prominent setae on the surface); proximal setae simple (sometimes small); small simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on all tergites, long simple and narrowly capitate (max length 0.07-0.12), prominent caudal plate setae present,  $\pm$  18, narrowly or distinctly capitate; sectasetae four pairs; marginal abdominal setae (other than sectasetae) four or more pairs, narrowly capitate (max length 0.19-0.22); pleurite setae paired simple, or paired narrowly capitate and simple. Legs with capitate setae present (often very narrow, max length 0.11-0.15); capitate foreleg setae absent; capitate middle leg setae present on femur and tibia, on the tibia 1-2 (typically 1 proximal and 1 distal, occasionally only distal present); capitate hind leg setae present on femur and tibia, on the tibia 1-2 (typically 1 proximal and 1 distal, occasionally only distal present).

*Host plant:* *Genista hispanica*, *G. florida*, *G. cf. pilosa*.

*Distribution:* Continental: Spain.

*Comment:* Apparently widespread in Spain but restricted to montane regions, this species has been recorded from the Sierra Nevada in the south to the Picos de Europa in the north. It is uncommon and was not collected by this author. There is a superficial similarity in the male and female genitalia to *A. spartiophila*. However, in many respects, notably the shape of the ovipositor and the nymph, this species is closer to a *Livilla*-type. The original description by Ramírez Gómez (1956) cites two basal metatarsal spurs. As all material examined has one spur there is the possibility that these specimens are not the same as the type species. However, no material from which the original description was made still exists, and so this discrepancy will likely remain unresolved.

*Material examined:* SPAIN:1E, Huelva, 20 km S of Almonte, ex *Genista* sp., 13.vi.1977 (BMNH). 2Γ,1E, Sierra Nevada, Pico Veleta rd, 2500 m, ex *Cytisus purgans?*, 5.viii.1978 (BMNH). 3Γ,3E, 9 nymphs, Picos de Europa, Peña Romana, abv Santa Marina de Valdeón, 1700 m, ex *Genista* cf. *pilosa*, 9.viii.1993 (BMNH). 1Γ,1E, 2 nymphs, as for previous except, 1800 m, ex *Genista hispanica* (BMNH).

*Arytainilla sulci* (Vondráček)

(Figs 1B & 22B)

*Psylla sulci* Vondráček, 1954: 81

*Arytainilla egena* Loginova, 1972: 18 [synonymized by Burckhardt, 1989b: 318]

*Arytainilla sulci* (Vondráček) Burckhardt, 1989b: 318

*Adult Colour:* Yellow-green to yellow-grey, sometimes with bright green or brown abdomen; legs ochraceous to brown; forewing membrane yellowish, veins uniformly pale.

*Adult Descriptions:* Vondráček (1954), Loginova (1972).

*Nymph*

*Colour:* Bright green to yellow-green, abdomens sometimes orange or wings and abdomen tinged with black; terminal antennal segments darker brown.

*Structure:* Forewing pads and abdomen broadly rounded apically. Tergites not extensively reduced on the thorax and extending to the lateral margin on the abdomen. Arolium pad short, expanded apically, without medial groove and with a long petiole. Circumanal ring narrowly



crescent-shaped with well rounded anterior lobes but with lateral margins either straight or slightly concave, outer ring not contiguous with the apical abdominal margin and with a single row of pores.

*5<sup>th</sup> instar measurements and ratios:* (specimens 10) BL: 2.2-2.53; BW: 1.48-1.6; WL: 0.72-0.81; CPL: 0.67-0.76; CPW: 0.97-1.1; RW: 0.16-0.2; RL: 0.11-0.12; HW: 0.83-0.92; AL: 0.85-0.95; AL3: 0.19-0.22. WBL: 0.62-0.66; ALHW: 0.98-1.09; ALWL: 1.09-1.22; WLHW: 0.85-0.9; WCPL: 1.36-1.52; CPRW: 5.21-6.56.

*5<sup>th</sup> instar chaetotaxy:* Head setae simple and narrowly capitate (anterior margin typically simple, occasionally capitate, max length at anterior margin 0.09-0.12); antennal setae simple and capitate (capitate setae typically present on all segments except 1<sup>st</sup>, 1-2 larger apically on the 3<sup>rd</sup> and 5<sup>th</sup> segments, smaller present on the remainder); ocular seta absent (possibly very small, but undetected in specimens examined); primary and secondary post-ocular seta distinctly, or occasionally narrowly capitate (max length 0.08-0.11). Dorsal thoracic setae short simple and long frequently narrowly capitate (max length 0.1-0.12). Prominent wing pad setae max length 0.1-0.12; forewing and hindwing pads with capitate setae only, prominent setae numerous, distinctly capitate, surface and marginal, proximal setae distinctly capitate. Dorsal abdominal prominent pre-caudal setae present on all tergites, long frequently narrowly capitate (max length 0.12), prominent caudal plate setae numerous, distinctly capitate; sectasetae one pair in the 4<sup>th</sup> position (as the medial bisection is indistinct these may appear as lanceolate setae); marginal abdominal setae (other than sectasetae) numerous, typically narrowly or distinctly capitate (apical pairs are longer and darkly pigmented, often narrowly capitate or simple) (max length 0.16-0.21); pleurite setae paired capitate and simple. Legs with capitate setae present on femora, tibiae and tarsi (max length 0.1-0.12), one distally on the femora and numerous on the tibiae.

*Host plant:* *Retama raetam*.

*Distribution:* Continental: Morocco, northern Libya, Israel and Jordan.

*Notes:* Occurs along the southern Atlantic coast and Anti-Atlas mountains of Morocco. It is sympatric with *Livilla retamae* and *Pseudacanthopsylla* spp. in Morocco and Jordan. *A. sulci* appears to develop earlier than either of these latter species in Morocco. It was the most abundant species on the host in March and was absent from collections made in June, when *Livilla retamae* and *Pseudacanthopsylla* (officially *Psylla improvisa*) were more common.

*Biology:* Nymphs were observed on the inner surface of the corolla.

*Comment:* Both adult and nymphal forms are unique within the Arytaininae.

*Material examined:* (ex *Retama raetam* unless otherwise stated) MOROCCO: 66Γ, 46E, 85 nymphs, Atlantic Coast, c. 15 km S of El Jadid, 32°55'N 8°35'W, c. 100 m, 21.iii.1999 (DP 297). 18Γ, 19E, 19 nymphs, Atlantic Coast, c. 10 km SE of Essaouira, 31°31'N 9°37'W, c. 100 m, 22.iii.1999 (DP 299). 3Γ, 3E, as for previous except, ex *Cytisus albidus* (DP 298). 2Γ, 4E, 4 nymphs, Southern Atlantic coast, E side of Agadir, 30°25'N 9°30'W, s.l. 23.iii.1999 (DP 301). 1Γ, 1E, as for previous except, 29.iv.1999 (DP 321). 1E, Anti-Atlas, SE slopes of Jbel Lekst, 29°42'N 9°05'W, c. 2000 m, 25.iii.1999 (DP 303). LIBYA: 4 nymphs, Fezzan, W of Fiqzah, 29.i.1982 (BMNH).

***Arytainilla montivaga* sp. nov. (4)**

(Figs 6 & 23B)

*Adult*

*Colour:* Generally bright green to mid-green or yellow-green, more mature specimens with darker abdomens; forewing membrane clear or faintly yellow, veins uniform light brown.

*Structure:* Forewing widest in the apical third with a broadly rounded apex; pterostigma less than one quarter the wing length (shorter in the Moroccan specimens – one half to two thirds as long as the Spanish specimens); surface forewing spinules present in all cells (or if absent, only from cell c+sc) but reduced, confined mostly to the margin of the wing; distribution of spinules uniform, density sparse: less than 40 per 0.1mm<sup>2</sup>; apical spines in wing cells cu<sub>1</sub>, m<sub>1</sub> and m<sub>2</sub>, but absent, or occasionally few present in cell r<sub>2</sub>. Antennae short, with ten segments; genal cones very short, commencing ventrally relative to the vertex, with a distinct depression between the vertex and the genal cones, terminal setae as long as, or typically longer than the vertex. Paramere mid-length, in lateral view simple with sides parallel, narrowing at the apex and with rudimentary development of an apical blade, sclerotized apex flattened dorsally with slight anterior projection, in dorsal view contiguous anteriorly with inner margin straight edged; paramere shorter or slightly longer than the proctiger; proctiger not inflated posteriorly towards the base; aedeagus distal segment with a flattened, shallow hook and, in Moroccan specimens, with a pronounced heel at the rear of the hook, tip of aedeagus hook acute; male subgenital plate dorsal profile more or less straight and horizontal or slightly raised anteriorly. Female

proctiger dorsal profile more or less straight from anus to apex (Spanish specimens) or with a post-anal depression but subsequently more or less straight (Moroccan specimens), apex bluntly rounded; subgenital plate ventral profile angled medially, apex acute; ovipositor valvulae ventralis slender, apex acute; height of valvulae dorsalis greater than valvulae ventralis, dorsally convex, wedge-shaped and tapering to the apex. (The specimens from Morocco are in all respects considerably smaller than those from Spain.)

*Adult measurements and ratios:* (4 $\Gamma$ , 6E) total length:  $\Gamma$  2.44-3.12, E 2.88-3.4; forewing:  $\Gamma$  length 1.9-2.4 width 0.81-1.05, E length 2.43-2.8 width 1.06-1.2; pterostigma length  $\Gamma$  0.33-0.5, E 0.3-0.6; hindwing length  $\Gamma$  1.56-1.95, E 1.98-2.21; head width:  $\Gamma$  0.73-0.8, E 0.79-0.88; antennal length: 1.25-1.49; genal cone length: 0.09-0.11; distal proboscis segment length: 0.15-0.17. WLPT: 4.6-8.3; ALHW: 1.52-1.84; GCVL: 0.4-0.55; WLHW: 2.6-3.29; VLW: 0.4-0.46; WLW: 2.29-2.38; CUR: 1.5-1.76; MR: 0.46-0.63; RMCU: 4.5-6.22; TLFL: 1.16-1.25; TLHW: 0.76-0.88; SCHW: 0.89-1; ATIB: 0.23-0.3; MTIB: 0.26-0.3; PBHW: 0.19-0.22; ATMT: 0.83-1. *Adult genitalia*  $\Gamma$ : MP: 0.29-0.38; PL: 0.28-0.42; AEL: 0.23-0.3; AEH: 0.08-0.10. MPHW: 0.4-0.48; PLHW: 0.38-0.53; MPPL: 0.9-1.04; AEPL: 0.71-0.82; MSLH: 1.12-1.22; AHS: 0.32-0.37; PLSH: 1.17-1.24. E: FP: 0.66-0.79; FSP: 0.42-0.57; RL: 0.2-0.23; OV: 0.13-0.16; EL: 0.24-0.28. FPHW: 0.83-0.93; FPSP: 1.34-1.6; FPCR: 3.3-3.55; OLSP: 0.25-0.31; FEOL: 1.84.

### *Nymph*

*Colour:* 1<sup>st</sup>-3<sup>rd</sup> instars cream and orange, 4<sup>th</sup>-5<sup>th</sup> instars bright mid- to light green or yellow-green, with or without black tergites; sclerites, wing pads, legs and terminal antennal segments darker brown.

*Structure:* Forewing pads and abdomen broadly rounded apically. Tergites extensively reduced on the thorax, typically not extending to the lateral margin on the abdomen. Arolium pad short, expanded apically, with slight medial groove and short petiole. Circumanal ring broadly crescent-shaped with well rounded anterior lobes, outer ring not contiguous with the apical abdominal margin and with a single row of pores.

*5<sup>th</sup> instar measurements and ratios:* (specimens 6) BL: 1.28-2.03; BW: 0.95-1.28; WL: 0.49-0.62; CPL: 0.35-0.44; CPW: 0.61-0.74; RW: 0.15-0.17; RL: 0.1-0.12; HW: 0.62-0.79; AL: 0.81-0.84; AL3: 0.18-0.2. WBL: 0.61-0.74; ALHW: 1.06-1.34; ALWL: 1.35-1.65; WLHW: 0.74-0.92; WCPL: 1.39-1.97; CPRW: 4.06-4.63.

*5<sup>th</sup> instar chaetotaxy*: Head setae simple and distinctly capitate (simple anteriorly, with few capitate posteriorly, max length at anterior margin 0.11-0.16); antennal setae simple and capitate (1-2 capitate on the distal end of 3<sup>rd</sup> and 5<sup>th</sup> segments); ocular seta simple, long (max length 0.07-0.12); primary and secondary post-ocular seta distinctly capitate (primary max length 0.1-0.12, secondary max length 0.13-0.18). Dorsal thoracic setae long capitate (max length 0.13-0.17). Prominent wing pad setae max length 0.12-0.18; forewing pad with simple and capitate setae, prominent setae 12-16, distinctly capitate, surface and marginal ( $\pm 8$  on the outer margin, 2-4 proximal, 2-4 surface) with small, simple setae scattered on the surface; hindwing pad with capitate setae only, prominent setae 5-7, distinctly capitate, surface and marginal (2 apical, 2 proximal, 1-3 surface); proximal setae distinctly capitate. Dorsal abdominal prominent pre-caudal setae present on all tergites, long capitate (max length 0.13-0.19), prominent caudal plate setae present, eight distinctly capitate; sectasetae absent (replaced by four pairs of small simple setae); marginal abdominal setae (other than sectasetae) four pairs, distinctly capitate (4<sup>th</sup> typically narrow) (max length 0.2-0.23); pleurite setae paired capitate and simple. Legs with capitate setae present (max length 0.12-0.13); capitate foreleg setae present on femur and tibia, on the tibia 2 (1 proximal, 1 distal); capitate middle leg setae present on femur and tibia, on the tibia 3 (2 proximal, 1 distal); capitate hind leg setae present on femur and tibia, on the tibia 3-5.

*Host plant*: *Adenocarpus decorticans*.

*Distribution*: Continental: Spain and Morocco.

*Notes*: Occurs in the mountain ranges of southern Andalusia and northern Morocco. *A. montivaga* is sympatric in the Andalusian mountains with *Livilla baetica* sp. nov.

*Biology*: Nymphs were observed on the base of young leaves, in leaf buds and on fruits.

*Etymology*: Named for the geographic distribution of this species in montane regions, the epithet is derived from the Latin for 'wandering over mountains'.

*Comment*: The host plant distribution illustrates the Tertiary links between southern Iberia and NW Africa (Valdés 1991). Populations of *A. montivaga* from these two regions are morphological distinct. However, although the Moroccan form is considerably smaller and differs in the shape of the male aedeagus and female proctiger, it otherwise shares sufficient similarity to the Spanish form for them to be treated as a single species. The 5<sup>th</sup> instar chaetotaxy exhibits some similarity with an *Arytaina*-type while the short genal cones and well developed pterostigma of the adult suggest affinities with *Arytinnis* gen. nov. However, *A.*

*montivaga* lacks the full suite of characters of either of these genera and thus the placement of this taxon is uncertain.

*Type material:* Holotype ♂ (slide mounted), SPAIN: Andalusia, N slopes of Sierra de Baza, rd Caniles to Alba, 37°15'N 2°45'W, c. 1600 m, 22.iii.1998 (BMNH). Paratypes 2E, 17 nymphs, as for holotype (BMNH). 2♂, 1E, 10 nymphs, as for holotype (NHMB).

*Other material examined:* MOROCCO: 5♂, 5E, Central Rif Mountains, S of Ketama, 34°55'N 4°40'W, c. 1300 m, 21.vi.1998 (DP 249). 2♂, 1E, 22 nymphs, Western Rif Mountains btw Ketama and Chefchaouen, E of Bab Berret, 34°56'N 4°50'W, c. 1400 m, 22.vi.1998 (DP 253). 3E, 50 nymphs, as for previous (DP 254). 4 nymphs, Taza, Jbel Tazzeke, 33°50'N 4°18'W, c. 1550 m, 31.iii.1999 (DP 318). SPAIN: 12♂, 12E, 10 nymphs, Andalusia, N slopes of Sierra Nevada, rd Calaharra to Puerto de la Ragua, 37°05'N 3°02'W, c. 1850 m, 21.iii.1998 (DP 128). 21♂, 10E, 30 nymphs, as for holotype (DP 129).

#### Genus *Arytinnis* gen. nov.

*Arytainilla* Loginova, 1972: 17, in part; Hodkinson & Hollis, 1987:41, in part

Type species: *Arytainilla pileolata* Loginova, 1976: 26

*Adult Description:* Generally bright green to grey green (some species become brown with age), lacking distinct body and wing membrane patterns; terminal antennal segments brown; forewing cells either clear or faintly yellow throughout, with or without light brown apical patches, forewing veins either uniformly pigmented light to dark brown, or with distinct light and dark bands. Forewing widest in the apical third with a broadly rounded apex; costal break and pterostigma present, pterostigma long, one quarter or greater the length of the wing; vein Rs typically curved in the middle but not, or only weakly curved at the apex towards the costal margin; cells cu<sub>1</sub> and m<sub>2</sub> relatively high; costal margin of the hindwing slightly concave. Antennae with ten segments. Head deflexed downwards with genal cones directed downwards relative to the plane of the vertex; genal cones short, commencing ventrally relative to the vertex, with a distinct depression between the vertex and the genal cones; terminal setae as long as or typically longer than the vertex. Distal proboscis segment short to very long. Number of basal tibial spurs variable, typically five (3+1+1) though individuals may have as few as three; one metatarsal spur. Paramere longer than the proctiger, in lateral view either simple, tapering

to the apex or with an apically thin neck above a medial blade or ridge, apex narrower than the base. Profile of female proctiger variable, apex bluntly rounded; subgenital plate shallowly curved or with a medial bulge, apex acute; ovipositor valvulae ventralis slender, apex acutely rounded with or without small dorsal projections at the tip; height of valvulae dorsalis typically as great or greater than valvulae ventralis, dorsally convex, wedge-shaped and tapering to the apex.

*Nymphal Description:* Variable in colour, generally with darker brown sclerites, wing pads, legs and terminal antennal segments; prominent setae pigmented light to dark brown. Forewing pads and abdomen broadly rounded apically. Antennal segments seven, eight or nine. Tergites extensively reduced on the thorax, typically not extending to the lateral margin on the abdomen. Arolium pad long, broadly expanded apically, usually with a distinct medial groove and long petiole. Circumanal ring broadly crescent-shaped with well rounded anterior lobes, outer ring not contiguous with the apical abdominal margin and with a single row of pores. Antennae and head without distinctly capitate setae. Eyes with a single ocular seta positioned towards the inner margin. Wing pads with prominent setae present, either capitate or simple. Abdomen with three to four pairs of marginal setae. Legs with or without capitate setae.

*Etymology:* Named in part for the subfamily Arytaininae, 'Aryt-', together with the Gaelic for island, 'innis' in reference to the probable origin and extensive diversification of this group in Macaronesia. To be treated as a feminine noun.

*Comment:* The genus is defined by the combination of characters: short genal cones with long terminal setae; apically broad and well rounded forewing with an unpatterned membrane and a long, well developed pterostigma; ovipositor slender with small dorsal valvulae. The 5<sup>th</sup> instar nymphs have long antennae and three or more pairs of setae. This is a homogeneous group of 21 species which appears to have radiated recently, mostly in the Macaronesian region and to a much lesser extent on the continent. Interspecific differentiation is based mainly on peculiarities of the male genitalia. Due to this overall similarity within the group there are only a few clear morphological synapomorphies such as banded forewing veins, elongate genitalia, and number of nymphal antennal segments. It may be easier to base an immediate identification using geographic region and host plant (although these aspects have not been used directly in

the keys) but care must be taken in the Canary Islands where a number of species occur sympatrically on the same host or on hosts that grow in close association.

Key to adults of *Arytinnis*

- 1 Forewing veins with distinct light and dark banding ..... 2  
 — Forewing veins uniformly coloured, pale to mid-brown ..... 3
- 2 Forewing veins with longer dark bands and fewer short, light bands; male paramere (in lateral view) with an apically thin neck above a broad, medially positioned blade produced on the external side and directed anteriorly, sclerotized apex with slight anterior and posterior projections; tip of aedeagus hook not upturned; male subgenital plate dorsal profile slightly raised anteriorly, usually without a distinct step (on *Adenocarpus*; Tenerife, La Palma) ..... *proboscidea* (Loginova)  
 — Forewing veins with light and dark bands of more or less equal frequency; male paramere (in lateral view) tapering towards the apex, without a medial blade, sclerotized apex with a pronounced anterior projection; tip of aedeagus hook slightly upturned; male subgenital plate dorsal profile markedly raised anteriorly with a distinct step (on *Adenocarpus foliolosus*; Gran Canaria, Tenerife, La Gomera) ..... *nigralineata* (Loginova)
- 3 Males and females with strikingly large genitalia, female proctiger longer than 1.2 x head width; male paramere longer (> 0.5 mm) than 0.7 x head width ..... 4  
 — Male and female genitalia smaller, female proctiger shorter than 1.2 x head width, male paramere shorter ( $\leq 0.5$  mm) than 0.7 x head width ..... 7
- 4 Male paramere broad and female genitalia robust; male paramere with a medially positioned blade produced on the external side and directed anteriorly, sclerotized apex (in lateral view) dorsally flattened with a slight medial depression and broadly expanded with small anterior and posterior projections; in dorsal view, contiguous posteriorly with inner margins concave; tip of aedeagus hook acute, not, or only slightly upturned; surface forewing spinules dense (60-100 per  $0.1\text{mm}^2$ ) (on *Teline stenopetala*; Tenerife) (Fig. 10) ..... *menceyata* sp. nov.  
 — Male paramere and female genitalia slender and elongate; male paramere in the basal portion more or less parallel sided without a medial blade but with a prominent shoulder on the anterior margin towards the apex, above which the apex curves inwards, sclerotized apex (in lateral view) small, with small anterior projection, and displaced to the interior and posterior of the top of the paramere; in dorsal view, contiguous anteriorly with inner

- margins straight edged; tip of aedeagus hook blunt and markedly upturned; surface forewing spinules sparse (less than 40 per 0.1 mm<sup>2</sup>) ..... 5
- 5 Larger species: (total length  $\Gamma$  2.96-3.72, E 3-4.04) antennae longer than 1.5 mm; forewing longer than 2.4 mm; head wider than 0.75 mm; distal proboscis segment  $\geq$  0.15 mm; male proctiger longer than 0.4 mm; distal aedeagus segment longer than 0.34 mm; female proctiger longer than 1 mm; female subgenital plate longer than 0.6 mm; male paramere (in lateral view) either with a sloping anterior shoulder produced about two thirds up from the base and with the apex (in dorsal view) strongly S-curved; or with a horizontal anterior shoulder close to the apex, about three quarters up from the base and with the apex (in dorsal view) not or only weakly curved ..... 6
- Smaller species: (total length  $\Gamma$  2.6-2.84, E 2.76-3.16) antennae shorter than 1.5 mm; forewing shorter than 2.4 mm; head narrower than 0.75 mm; distal proboscis segment  $<$  0.15 mm; male proctiger shorter than 0.4 mm; distal aedeagus segment shorter than 0.34 mm; female proctiger shorter than 1 mm; female subgenital plate shorter than 0.6 mm; male paramere (in lateral view) with a horizontal anterior shoulder close to the apex, about three quarters up from the base and with the apex (in dorsal view) distinctly curved (on *Teline stenopetala*; La Gomera) (Figs 14 & 15C–D) ..... ***hupalupa* sp. nov.**
- 6 Male paramere (in lateral view) with a posterior bulge at the base and with a sloping anterior shoulder produced about two thirds up from the base, the apex curving posteriorly and (in dorsal view) strongly S-curved and expanded towards the sclerotized tip (on *Chamaecyctisus*; Gran Canaria, Tenerife, La Gomera) (Figs 15E–F) .. *dividens* (Loginova)
- Male paramere (in lateral view) without a posterior bulge at the base and with a sharper, horizontal anterior shoulder closer to the apex, about three quarters up from the base, the apex not or weakly curving posteriorly and (in dorsal view) not or weakly curved and tapering towards the sclerotized tip (on *Chamaecyctisus* and *Teline stenopetala*; La Palma, El Hierro) (Figs 15A–B) ..... *modica* (Loginova)
- 7 Male paramere (in lateral view) with an apically thin neck above a medially positioned blade (sometimes reduced to a shallow ridge) produced on the external side and directed anteriorly; sclerotized apex dorsally either slightly rounded or with a distinct bulge, and with slight anterior or posterior projections ..... 8
- Male paramere (in lateral view) without a medial blade or ridge, either simple with sides tapering towards the apex or more parallel sided with a slight terminal blade present



- laterally exterior to the apex, and then with the sclerotized apex displaced either to the interior or posterior of the top of the paramere; sclerotized apex either dorsally rounded with or without small anteriorly and interiorly directed hook, or flattened with small anterior projection ..... 14
- 8 Male paramere longer than 0.4 mm ..... 9  
(Continental and Madeira; *cognata*, *hakani*, *incuba*)
- Male paramere shorter than 0.4 mm ..... 11  
(Continental and Canary Islands; *berber*, *canariensis*, *ochrita*, *pileolata*,)
- 9 Male paramere (in lateral view) with distinct medial blade, sclerotized apex dorsally with a slight medial depression and small anterior and posterior projections; male proctiger shorter ( $< 0.27$  mm) than  $0.6 \times$  paramere length; female proctiger longer than  $1.65 \times$  length of subgenital plate; female subgenital plate ventral profile usually with a medial bulge (on *Genista florida*; Morocco) ..... *cognata* (Loginova)
- Male paramere (in lateral view) with shallow medial ridge, sclerotized apex dorsally flattened with a small anterior projection; male proctiger longer ( $\geq 0.27$  mm) than  $0.6 \times$  paramere length; female proctiger length  $\leq 1.65 \times$  length of subgenital plate; female subgenital plate ventral profile shallowly curved without a medial bulge ..... 10
- 10 Male paramere shorter ( $< 0.45$  mm) than  $0.55 \times$  head width, in lateral view the apical neck, above termination of the medial blade, longer and more slender; male proctiger length  $\leq 0.3$  mm; female proctiger shorter than  $0.85$  mm (on *Teline monspessulana*; Mediterranean) ..... *hakani* (Loginova)
- Male paramere longer ( $> 0.45$  mm) than  $0.55 \times$  head width, in lateral view the apical neck, above termination of the medial blade, shorter and thicker; male proctiger longer than  $0.3$  mm; female proctiger length  $\geq 0.85$  mm (on *Teline maderensis*; Madeira) ..... *incuba* (Loginova)
- 11 Male paramere  $\leq 1.25 \times$  subgenital plate height, sclerotized apex (in lateral view) with slight anterior and posterior projections, and (in dorsal view) contiguous posteriorly; male proctiger longer than  $0.75 \times$  paramere length; head width  $\geq 0.72$  mm; distal aedeagus segment longer than  $0.26$  mm, hook larger ( $0.08$ - $0.1$  mm long) ..... 12
- Male paramere  $> 1.25 \times$  subgenital plate height, sclerotized apex (in lateral view) with small anterior projection, and (in dorsal view) contiguous anteriorly or contiguous more or less along entire inner margin; male proctiger length  $\leq 0.75 \times$  paramere length; head width  $\leq 0.72$  mm; distal aedeagus segment length  $\leq 0.26$  mm, hook small ( $\leq 0.08$  mm long) . 13

- 12 Genal cones very short ( $< 0.09$  mm), less than 0.5 x length of the vertex with the terminal setae darkly pigmented; distal proboscis segment long ( $\geq 0.2$  mm); male paramere (in lateral view) with distinct medial blade supporting several long stout setae, sclerotized apex dorsally with a well rounded bulge; male proctiger longer ( $> 0.3$  mm) than 0.85 x paramere length; tip of aedeagus hook blunt; hind leg tibia long, more than 0.9 x head width, metatarsus longer than apical tarsus (on *Teline canariensis*; Tenerife) (Figs 9 & 1M) ..... **canariensis sp. nov.**
- Genal cones longer ( $> 0.09$  mm), equal to or greater than 0.5 x length of the vertex with the terminal setae pale; distal proboscis segment shorter ( $< 0.2$  mm); male paramere (in lateral view) with shallow medial ridge supporting several short, stout setae, sclerotized apex dorsally flattened; male proctiger length ( $\leq 0.3$  mm) less than 0.85 x paramere length; tip of aedeagus hook acute; hind leg tibia relatively short, less than 0.9 x head width, metatarsus length equal to, or shorter than the apical tarsus (on *Teline*; Tenerife) ..... **pileolata** (Loginova)
- 13 Female proctiger length less than head width; surface forewing spinules sparse (less than 40 per  $0.1\text{mm}^2$ ); male paramere shorter ( $< 0.35$  mm) than 0.55 x head width, or 1.4 x subgenital plate height, sclerotized apex (in dorsal view) contiguous anteriorly; tip of aedeagus hook blunt; male proctiger shorter ( $< 0.24$  mm) than 0.35 x head width (on *Genista segonnei*; Morocco) (Fig. 16) ..... **berber sp. nov.**
- Female proctiger length greater than head width; surface forewing spinules relatively dense (40-60 per  $0.1\text{mm}^2$ ); male paramere longer ( $> 0.35$  mm) than 0.55 x head width, or 1.4 x subgenital plate height, sclerotized apex (in dorsal view) contiguous more or less along entire inner margin; tip of aedeagus hook acute; male proctiger longer ( $> 0.24$  mm) than 0.35 x head width (on *Teline osyroides*; Tenerife) (Fig. 11) ..... **ochrita sp. nov.**
- 14 Male paramere (in lateral view) more or less parallel sided with a slight terminal blade present laterally exterior to the apex, and with the sclerotized apex displaced either to the interior or posterior of the top of the paramere ..... 15
- Male paramere (in lateral view) simple, either straight or more curvaceous, with sides tapering towards the apex ..... 17
- 15 Surface forewing spinules sparse (less than 40 per  $0.1\text{mm}^2$ ); male paramere short and broad, length ( $< 0.35$  mm) equal to, or less than the height of the subgenital plate; male proctiger inflated towards the base; male subgenital plate dorsal profile raised anteriorly with a distinct step; female proctiger dorsal profile without a post-anal depression but

- concave with an upturned apex, shorter than 1.4 x length of subgenital plate; subgenital plate ventral profile with a pronounced medial bulge (on *Genista tenera*; Madeira) .....  
 ..... *umbonata* (Loginova)
- Surface forewing spinules relatively dense (40-100 per 0.1mm<sup>2</sup>); male paramere long and slender, length (> 0.35 mm) greater than the height of the subgenital plate; male proctiger not, or only slightly inflated towards the base; male subgenital plate dorsal profile more or less straight and horizontal, or slightly raised anteriorly; female proctiger dorsal profile either with a post-anal depression or more or less straight from anus to apex, length  $\geq$  1.4 x length of subgenital plate; subgenital plate ventral profile shallowly curved or with a slight medial bulge ..... 16
- 16 Genal cone terminal setae darkly pigmented; male paramere longer than 1.4 x height of subgenital plate, in lateral view apex not bent forwards, and with 3-4 stout setae at the top of the terminal blade, the sclerotized apex more or less triangular; sclerotized portion (in dorsal view) contiguous anteriorly with inner margins rounded; aedeagus hook small ( $\leq$  0.08 mm), about 0.25 x length of distal segment, tip of hook acute and turning upwards; female proctiger dorsal profile with a post-anal depression, shorter than 1.5 x length of subgenital plate; female subgenital plate without pointed projections on the dorsal margins (on *Teline*; Gran Canaria, Tenerife) (Fig. 30C) ..... *diluta* (Loginova)
- Genal cone terminal setae pale; male paramere shorter than 1.4 x height of subgenital plate, in lateral view curving forwards towards the apex, the terminal blade and sclerotized apex with anterior projections; sclerotized portion (in dorsal view) contiguous posteriorly with inner margins straight edged; aedeagus hook longer ( $\geq$  0.1 mm), about 0.33 x length of distal segment, tip of hook relatively blunt and not upturned; female proctiger dorsal profile more or less straight from anus to apex, longer than 1.5 x length of subgenital plate; female subgenital plate with pointed projections on the dorsal margins (on *Teline microphylla*; Gran Canaria) (Fig. 30D) ..... *equitans* (Loginova)
- 17 Male paramere (in lateral view) S-curved with the posterior margin strongly curved forward medially and with an isolated, medial field of stout spines on the interior surface, sclerotized apex more or less flattened with slight anterior projection; aedeagus distal segment longer than 0.85 x paramere length (on *Teline stenopetala*; La Gomera) (Fig. 13) ..... ***gomeræ* sp. nov.**
- Male paramere (in lateral view) with posterior margin more or less straight, if stout spines present on the interior surface, positioned and extending more towards the base of the

- paramere, sclerotized apex rounded with small anteriorly and interiorly directed hook, or small anterior projection; aedeagus distal segment shorter than 0.85 x paramere length .... 18
- 18 Surface forewing spinules sparse (less than 40 per 0.1mm<sup>2</sup>); antennae long (1.7-2.1 mm); male paramere interior surface with stout spines on the posterior and sometimes anterior sides of a medial ridge, sclerotized apex (in dorsal view) with inner margin concave; aedeagus distal segment apex with a well developed, curved hook; male subgenital plate dorsal profile slightly raised anteriorly (on *Teline stenopetala*; La Palma, El Hierro) (Figs 12 & 30E) ..... ***occidentalis* sp. nov.**
- Surface forewing spinules relatively dense (40-60 per 0.1mm<sup>2</sup>); antennae shorter (1.1-1.71 mm); male paramere interior surface either lacking stout spines or with stout spines present anteriorly at the base, sclerotized apex (in dorsal view) with inner margin straight edged or rounded with an acute point; aedeagus distal segment apex with a somewhat flattened, shallow hook; male subgenital plate dorsal profile more or less straight and horizontal .... 19
- 19 Male paramere longer than 1.3 x height of subgenital plate, sclerotized apex (in dorsal view) contiguous more or less along entire inner margin; aedeagus hook larger ( $\geq 0.08$  mm) with an acute tip; male proctiger  $\geq 0.4$  x head width; female proctiger length greater than the head width, with the circumanal ring shorter than 0.25 x proctiger length; female proctiger dorsal profile concave with a slightly upturned apex; female subgenital plate ventral profile with a medial bulge; ovipositor valvulae dorsalis longer than 0.15 mm (on *Teline microphylla*; Gran Canaria) ..... *prognata* (Loginova)
- Male paramere shorter than 1.3 x height of subgenital plate, sclerotized apex (in dorsal view) contiguous anteriorly; aedeagus hook small ( $\leq 0.08$  mm) with a blunt tip; male proctiger shorter than 0.4 x head width; female proctiger length less than the head width, with the circumanal ring longer than 0.25 x proctiger length; female proctiger dorsal profile more or less straight from anus to apex; female subgenital plate ventral profile shallowly curved without a medial bulge; ovipositor valvulae dorsalis shorter than 0.15 mm ..... 20
- 20 Antennae longer than 1.5 mm, equal to, or greater than 2 x head width; genal cones larger; distal proboscis segment ( $\leq 0.15$  mm) shorter than 0.2 x head width; male paramere interior surface with stout spines present anteriorly at the base, and several long slender spines on the anterior margin, sclerotized apex (in dorsal view) with inner margins straight edged;

- hind leg tibia longer than 0.7 x head width (on *Teline splendens*; La Palma) (Figs 8 & 30F)  
 ..... **fortunata sp. nov.**
- Antennae shorter than 1.3 mm, about 1.5 x head width; genal cones smaller; distal proboscis segment (> 0.15 mm) longer than 0.2 x head width; male paramere interior surface lacking stout spines, with the anterior margin supporting several short, slender spines, sclerotized apex (in dorsal view) with inner margins rounded to an acute point; hind leg tibia shorter than 0.7 x head width (on *Teline rosmarinifolia*; Gran Canaria) (Figs 7 & 1N) ..... **romeria sp. nov.**

Key to 5<sup>th</sup> instar nymphs of *Arytinnis*. As the nymphs in this genus are structurally similar, the type and placement of setae becomes an important aid in species identification (see Fig. 2 for terminology).

- 1 Antennal segments nine ..... 2
- Antennal segments eight ..... 3
- Antennal segments seven ..... 4
- 2 Forewing and hindwing pads with simple setae only; dorsal caudal plate with six prominent setae; marginal abdominal setae (other than sectasetae) simple or narrowly capitate (on *Adenocarpus*; Tenerife, La Palma) (Fig. 26D) ..... **proboscidea** (Loginova)
- Forewing and hindwing pads with simple and capitate setae; dorsal caudal plate with four prominent setae; marginal abdominal setae (other than sectasetae) distinctly capitate (on *Adenocarpus foliolosus*; Gran Canaria, Tenerife, La Gomera) (Fig. 26C) ..... **nigralineata** (Loginova)
- 3 Antennae shorter than 1 mm, less than 1.5 x head width; primary and secondary post ocular setae distinctly capitate; dorsal thoracic setae short simple and long capitate; proximal forewing and hindwing pad setae distinctly capitate; hindwing pad with two prominent capitate setae (apical and proximal) (on *Teline stenopetala*; La Gomera) (Fig. 28A) ..... **gomeræ sp. nov.**
- Antennae longer than 1 mm, greater than 1.5 x head width; primary and secondary post-ocular setae simple or narrowly capitate; dorsal thoracic setae long simple; proximal forewing and hindwing pad setae simple or narrowly capitate; hindwing pad with one prominent capitate seta (apical) (on *Teline stenopetala*; La Palma, El Hierro) (Fig. 28B) .. **occidentalis sp. nov.**
- 4 Abdominal sectasetae three pairs ..... 5

- 
- Abdominal sectasetae four pairs ..... 10
  - 5 Legs with one or more distinct capitate setae present (if only one on tibiae – positioned distally) ..... 6
  - Legs with simple setae only (one small rod or reduced capitate may be present proximally on the tibiae of *equitans*) ..... 7
  - 6 Wing pads each with one prominent apical seta, proximal setae indistinct; antennae shorter than 0.8 mm, less than 1.3 x head width, or 1.68 x forewing pad length; secondary post-ocular seta indistinct; thorax dorsally with very short simple setae; small capitate setae present in typical position of first sectasetal pair; middle and hind tibiae each with one capitate seta (on *Teline osyroides*; Tenerife) (Fig. 27D) ..... ***ochrita* sp. nov.**
  - Wing pads each with two prominent setae – apical and proximal; antennae longer than 0.8 mm,  $\geq 1.3$  x head width, and greater than 1.68 x forewing pad length; secondary post-ocular seta prominent; thorax dorsally with with short and long simple setae; middle and hind tibiae each with two or more capitate setae (on *Chamaecytisus*; Gran Canaria, Tenerife, La Gomera) (Fig. 27C) ..... *dividens* (Loginova)
  - 7 Prominent forewing pad setae two (apical and proximal) (on *Teline microphylla*; Gran Canaria) (Fig. 28D) ..... *equitans* (Loginova)
  - Prominent forewing pad setae more than five ..... 8
  - 8 Antennae typically longer, greater than 1.95 x forewing pad length; secondary post-ocular and prominent dorsal thoracic setae longer (max length greater than 0.1 mm), capitate (minute simple only); ocular seta long and conspicuous (on *Teline maderensis*; Madeira) (Fig. 25C) ..... *incuba* (Loginova)
  - Antennae typically shorter, less than 1.95 x forewing pad length; secondary post-ocular and prominent dorsal thoracic setae shorter (max length 0.1 mm or less), not always capitate, thorax with short or longer simple as well as capitate setae; ocular seta usually shorter, less conspicuous ..... 9
  - 9 Thorax dorsally with short simple setae anteriorly and longer capitate posteriorly; ocular seta always small; secondary post-ocular setae always simple (on *Genista tenera*; Madeira) (Fig. 25A) ..... *umbonata* (Loginova)
  - Thorax dorsally with long simple and long capitate setae; size of ocular seta and type of secondary post-ocular setae variable (on *Teline monspessulana*; Mediterranean) .....  
..... *hakani* (Loginova)
  - 10 Legs with simple setae only ..... 11

- 
- Legs with one or more distinct capitate setae present ..... 14
  - 11 Prominent marginal abdominal setae (other than sectasetae) one pair in 1st position (on *Teline microphylla*; Gran Canaria) (Fig. 26A) ..... *prognata* (Loginova)
  - Prominent marginal abdominal setae (other than sectasetae) four pairs ..... 12
  - Prominent marginal abdominal setae (other than sectasetae) three pairs (absent from 4<sup>th</sup> position) ..... 13
  - 12 Antennae shorter than 0.9 mm; proximal wing pad setae indistinct; dorsal pre-caudal setae on posterior tergites; dorsal caudal plate with numerous prominent setae; marginal abdominal setae (other than sectasetae) simple (on *Teline*; Gran Canaria, Tenerife) (Fig. 26B) ..... *diluta* (Loginova)
  - Antennae longer than 0.9 mm; proximal wing pad setae prominent; dorsal pre-caudal setae on anterior tergites; dorsal caudal plate prominent setae absent or reduced; marginal abdominal setae (other than sectasetae) mostly capitate (on *Genista florida*; Morocco) (Fig. 25B) ..... *cognata* (Loginova)
  - 13 Antennae shorter than 0.9 mm; primary and secondary post-ocular setae distinctly capitate; proximal and outer margin forewing pad setae distinctly capitate; dorsal thoracic setae short simple and stout capitate; dorsal pre-caudal setae long capitate (on *Genista segonnei*; Morocco) (Fig. 25D) ..... ***berber* sp. nov.**
  - Antennae longer than 0.9 mm; primary and secondary post-ocular setae simple or narrowly capitate; proximal and outer margin forewing pad setae simple; dorsal thoracic setae short simple; dorsal pre-caudal setae long simple (on *Genista florida*; Morocco) (Fig. 25B) ..... *cognata* (Loginova)
  - 14 Prominent marginal abdominal setae (other than sectasetae) four pairs ..... 15
  - Prominent marginal abdominal setae (other than sectasetae) three pairs (absent from 4<sup>th</sup> position) ..... 17
  - 15 Forewing and hindwing pads each with more than five prominent setae on the surface and margin; dorsal pre-caudal setae on all tergites; dorsal caudal plate with numerous prominent setae, typically more than 20 (on *Teline stenopetala*; Tenerife) (Fig. 29C) ..... ***menceyata* sp. nov.**
  - Forewing and hindwing pads each with one or two prominent marginal setae; dorsal post-wing setae on anterior tergites, or indistinct; dorsal caudal plate prominent setae absent or if present 2-4 ..... 16

- 16 Forewing and hindwing pads each with one prominent capitate seta apically, proximal setae short simple or indistinct; dorsal pre-caudal setae short simple or indistinct; dorsal caudal plate prominent setae absent (on *Chamaecytisus* and *Teline stenopetala*; La Palma, El Hierro) (Fig. 27B) ..... *modica* (Loginova)
- Forewing and hindwing pads each with two prominent setae (apical and proximal), proximal setae prominent, simple or capitate; dorsal pre-caudal setae long simple or long capitate; dorsal caudal plate prominent setae present (on *Chamaecytisus*; Gran Canaria, Tenerife, La Gomera) (Fig. 27C) ..... *dividens* (Loginova)
- 17 Forewing pad with two prominent setae (apical and proximal) (max length  $\geq 0.1$  mm) (on *Chamaecytisus*; Gran Canaria, Tenerife, La Gomera) (Fig. 27C) ..... *dividens* (Loginova)
- Forewing pad with one prominent seta apically (proximal seta short simple or indistinct) (max length less than 0.1 mm) ..... 18
- Forewing pad with five or more prominent setae (max length  $\geq 0.1$  mm) ..... 19
- 18 Apical forewing pad seta simple or narrowly capitate; marginal abdominal pleurite setae paired simple (on *Teline stenopetala*; La Gomera) (Fig. 27A) ..... ***hupalupa* sp. nov.**
- Apical forewing pad seta distinctly capitate; marginal abdominal pleurite setae paired capitate and simple (on *Chamaecytisus* and *Teline stenopetala*; La Palma, El Hierro) (Fig. 27B) ..... *modica* (Loginova)
- 19 Antennae shorter than 0.8 mm, less than 1.3 x head width, and  $\leq 1.5$  x forewing pad length; hindwing pad with one prominent seta apically paired with a small rod or simple seta, proximal seta indistinct; hind tibia with one capitate seta distally (on *Teline rosmarinifolia*; Gran Canaria) (Fig. 29B) ..... ***romeria* sp. nov.**
- Antennae longer than 0.8 mm,  $\geq 1.3$  x head width, and greater than 1.5 x forewing pad length; hindwing pad with two or more prominent setae, apically with two paired capitate setae, proximal seta distinct; hind tibia with two or more capitate setae ..... 20
- 20 Antennae shorter than 1.7 x forewing pad length; ocular seta small, inconspicuous (0.04-0.05 mm), secondary post-ocular seta simple; dorsal thoracic setae short simple (0.03-0.05 mm); dorsal pre-caudal setae short simple; forewing and hindwing pads with simple and capitate setae, proximal setae simple; prominent hindwing pad capitate setae two (apical); hind tibia with more than two capitate setae (on *Teline splendens*; La Palma) (Fig. 29A) .  
..... ***fortunata* sp. nov.**
- Antennae longer than 1.7 x forewing pad length; ocular seta long, conspicuous (0.08-0.1 mm); secondary post-ocular seta distinctly capitate; dorsal thoracic setae long (0.08-0.1



mm), only capitate, or with simple setae; dorsal pre-caudal setae long capitate; forewing and hindwing pads with capitate setae (minute rod or simple), proximal setae distinctly capitate; prominent hindwing pad capitate setae more than two (apical and proximal); hind tibia with two capitate setae (proximal and distal) (on *Teline*; Tenerife) (Fig. 28C) .....  
 ..... *pileolata* (Loginova)

*Arytinnis pileolata* (Loginova) **comb. nov.**

(Fig. 28C)

*Arytainilla pileolata* Loginova, 1976: 26

*Adult Colour*: Pale grey-green or yellow-green; forewing cells with faint brown patches apically, veins uniform light or dark brown.

*Adult Description*: Loginova (1976).

*Nymph*

*Colour*: 1<sup>st</sup>-3<sup>rd</sup> instars cream and black or orange-red, 4<sup>th</sup>-5<sup>th</sup> instars green with black tergites.

*Structure*: Antennal segments seven.

*5th instar measurements and ratios*: (specimens 4) BL: 1.53-1.8; BW: 0.98-1.03; WL: 0.49-0.55; CPL: 0.46-0.5; CPW: 0.63-0.72; RW: 0.19-0.2; RL: 0.11-0.12; HW: 0.64-0.68; AL: 0.91-0.96; AL3: 0.22-0.25. WBL: 0.58-0.67; ALHW: 1.4-1.48; ALWL: 1.73-1.96; WLHW: 0.72-0.86; WCPL: 1.37-1.53; CPRW: 3.15-3.79.

*5th instar chaetotaxy*: Head setae simple (max length at anterior margin 0.13-0.16); ocular seta simple or occasionally narrowly capitate, dark, conspicuous (max length 0.08-0.1); primary and secondary post-ocular setae distinctly capitate (max length 0.08-0.1). Dorsal thoracic setae long, capitate only or with simple (max length 0.08-0.11). Prominent wing pad setae max length 0.11-0.13; forewing and hindwing pads with capitate setae only (minute simple or sometimes small rod setae on the wing pad surfaces), prominent forewing pad setae 6-9, distinctly capitate, marginal (4-5 larger, 1-3 smaller and 1 proximal); prominent hindwing pad setae 3-4, distinctly capitate, surface and marginal (1-2 apical, 1 surface, 1 proximal). Dorsal abdominal prominent pre-caudal setae present on anterior tergites, long capitate (max length 0.12), prominent caudal plate setae absent or if present, two, distinctly capitate; sectasetae four pairs (1<sup>st</sup> pair sometimes reduced); marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate (max length 0.13-0.16); pleurite setae paired capitate and simple. Legs with

capitate setae present (max length 0.08-0.09); capitate foreleg setae absent; capitate middle leg setae absent or if present, on tibia only, one (distal) with or without small rod proximally; capitate hind leg setae present on tibia only, 2-3 (1 proximal, 1-2 distal) with 4-5 small rod setae.

*Host plant:* *Teline canariensis*, *T. osyroides* ssp. *sericea*, *T. stenopetala* ssp. *spachiana*.

*Distribution:* Canary Islands: Tenerife.

*Notes:* This is the most polyphagous species in *Arytinnis* gen. nov., occurring on three species of host plant in the genus *Teline*. It is found throughout the range of the host plant, *Teline canariensis*, where other sympatric species are restricted to the relict laurisilva habitat of this host. It is sympatric with *A. menceyata* on *Teline stenopetala* ssp. *spachiana* in pine forest habitat, and it is the only species on *Teline osyroides* ssp. *sericea* in the southern xerophytic habitat.

*Biology:* Small nymphs (1<sup>st</sup>-2<sup>nd</sup> instars) were observed at the base of developing fruit under the persistent clayx, and in leaf buds.

*Comment:* This species is selected as the type for the genus as it possesses the more typical generic features: small female genitalia, male paramere with an anterior medial ridge and forewing veins uniformly pigmented.

*Material examined:* CANARY ISLANDS. TENERIFE: 1Γ, 6E, 7 nymphs, rd Buenavista to Santiago del Teide, N of turning to Los Carrizales, 28°19'N 16°50'30"W, 900 m, ex *Teline canariensis*, 28.vi.1997 (DP 21). 3Γ, 2E, just blw Aguamansa, 28°21'30"N 16°30'W, 950 m, ex *Teline stenopetala*, 29.vi.1997 (DP 23.1). 4Γ, 4E, 2 nymphs, Anaga, rd El Bailadero to Taganana, 28°32'30"N 16°12'W, 550 m, ex *Teline canariensis*, 30.vi.1997 (DP 30). 14Γ, 12E, 2 nymphs, Teno, 7 km S of Buenavista on rd to Santiago del Teide, 28°20'N 16°51'W, c. 800 m, ex *Teline canariensis*, 4.iv.1998 (DP 152). 14Γ, 16E, rd El Socorro to La Laguna, abv El Portezuelo, nr El Pulpito, 28°29'30"N 16°21'15"W, c. 600 m, ex *Teline canariensis*, 25.iv.1998 (DP 178). 4Γ, 5E, Anaga, E of Pico del Inglés, 28°32'15"N 16°16'30"W, c. 960 m, ex *Teline canariensis*, 25.iv.1998 (DP 179). 4Γ, 4E, 2 nymphs, Güímar, Caldera de Pedro Gil, 28°20'30"N 16°28'W, 1775 m, ex *Teline stenopetala*, 26.iv.1998 (DP 182). 10Γ, 10E, Anaga, E of El Bailadero, 28°33'15"N 16°10'30"W, c. 800 m, ex *Teline canariensis*, 1.v.1998 (DP 183). 39Γ, 35E, 14 nymphs, Barranco de Herques, 28°14'45"N 16°26'30"W, c. 500-600 m, ex *Teline*

*osyroides*, 2.v.1998 (DP 184). 19Γ, 11E, 1 nymph, NW of Arona, Barranco del Rey, 28°06'30"N 16°41'30"W, c. 700 m, ex *Teline osyroides*, 10.v.1998 (DP 186). 2Γ, 8E, 2 nymphs, nr La Vega, 28°20'30"N 16°44'W, c. 800 m, ex *Teline stenopetala* and hybrids x *T. canariensis*, 31.v.1998 (DP 229).

*Arytinnis nigrilineata* (Loginova) **comb. nov.**

(Figs 26C, 1G, 1L & 30A)

*Arytainilla nigrilineata* Loginova, 1976: 19

*Adult Colour*: Bright green, lacking the darker colouration in mature specimens characteristic of *A. proboscidea*; head and genal cones with darkly pigmented setae. Forewing cells with faint brown patches, veins with numerous short, light and dark bands.

*Adult Description*: Loginova (1976).

*Nymph*

*Colour*: 1<sup>st</sup>-2<sup>nd</sup> instars pale orange or cream, 3<sup>rd</sup>-5<sup>th</sup> instars pale green to bright green or orange and cream, with or without black tergites.

*Structure*: Antennal segments nine

*5th instar measurements and ratios*: (specimens 7) BL: 1.55-1.85; BW: 0.98-1.13; WL: 0.51-0.55; CPL: 0.46-0.51; CPW: 0.62-0.7; RW: 0.17-0.19; RL: 0.1-0.12; HW: 0.69-0.74; AL: 0.99-1.18; AL3: 0.25-0.29. WBL: 0.6-0.63; ALHW: 1.45-1.66; ALWL: 1.91-2.23; WLHW: 0.7-0.76; WCPL:1.35-1.4; CPRW: 3.44-3.82.

*5th instar chaetotaxy*: Head setae simple (max length at anterior margin 0.13-0.18); ocular seta simple, dark, conspicuous (max length 0.04-0.09); primary post-ocular seta simple or narrowly capitate (max length 0.12-0.13); secondary post-ocular seta simple or narrowly capitate (max length 0.14-0.15). Dorsal thoracic setae long, simple and narrowly capitate (max length 0.12-0.14). Prominent wing pad setae max length 0.12-0.17; forewing and hindwing pads with simple and capitate setae; each pad with two prominent setae, simple or narrowly capitate, marginal (1 apical, 1 proximal); hindwing pad apical seta paired with small simple seta; small simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on anterior tergites, long simple and narrowly capitate (max length 0.14), prominent caudal plate setae present, usually four simple or narrowly capitate; sectasetae three pairs;

marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate (max length 0.14-0.18); pleurite setae paired simple or slightly capitate. Legs with simple setae only (max length 0.05-0.07).

*Host plant: Adenocarpus foliolosus.*

*Distribution:* Canary Islands: Gran Canaria, Tenerife, and La Gomera.

*Notes:* Occurs on the two central islands and one western island, where it is restricted to lower altitudes and more humid habitats than the other *Adenocarpus*-feeding species, *A. proboscidea*. It can also be found sympatrically with *A. proboscidea* in the extensive host hybrid zone between *Adenocarpus foliolosus* and *Adenocarpus viscosus* on Tenerife, and occasionally on *Adenocarpus viscosus* where this host is found at lower altitudes on the humid, northern pine forest slopes.

*Biology:* Eggs were found in inflorescences on the inner surface of bracts. Nymphs were frequently observed on inflorescences.

*Material examined:* (ex *Adenocarpus foliolosus* unless otherwise stated) CANARY ISLANDS. GRAN CANARIA: 26Γ, 20E, 50 nymphs, 1-2 km S of Cruz de Tejada, 27°59'30"N 15°36'W, 1480 m, 5.vii.1997 (DP 36). 1E, as for previous except, ex *Teline microphylla* (DP 35). 10Γ, 7E, 1 nymph, rd from Moya to Fontanales, 28°5'30"N 15°35'W, 800 m, 6.vii.1997 (DP 42). 9Γ, 10E, 1 nymph, just blw Pinos de Gáldar, 28°2'30"N 15°37'30"W, 1400 m, 6.vii.1997 (DP 43). 18Γ, 25E, 2 nymphs, c. 3.5 km NW of Cruz de Tejada on rd to Pinos de Gáldar, 28°1'30"N 15°35'30"W, 1600 m, 7.vii.1997 (DP 46). 1E, c. 5 km S of Moya on rd to San Bartolomé de Fontanales, 28°5'N 15°35'30"W, c. 800 m, ex *Teline stenopetala*, 15.iv.1998 (DP 158). 19Γ, 14E, rd Moya to San Bartolomé de Fontanales, 28°5'45"N 15°35'15"W, c. 700 m, 19.iv.1998 (DP 170). 1Γ, rd Moya to St Bartolome de Fontanales, 28°5'30"N 15°35'W, c. 600 m, ex *Teline canariensis*, 19.iv.1998 (DP 171). 37Γ, 34E, 1 nymph, just N of Cruz de Tejada, 28°30'N 15°35'30"W, c. 1500 m, 20.iv.1998 (DP 173). 4Γ, 6E, as for previous except, ex *Teline microphylla*, 20.iv.1998 (DP 172). 1E, 1-2 km S of Cruz de Tejada, 28°00'N 15°36'W, 1420 m, ex *Teline microphylla*, 20.iv.1998 (DP 175). TENERIFE: 5Γ, 6E, 1 nymph, rd from La Laguna to Parque Nacional del Teide, c. 5 km SW of Las Raíces, 28°26'N 16°22'30"W, 1190 m, 22.vi.1997 (DP 4). 2Γ, 1E, c.14 km south of Aguamansa, rd Aguamansa to El Teide, 28°19'N 16°33'30"W, 1200 m, ex *Adenocarpus viscosus*, 29.vi.1997 (DP 24). 5Γ, 9E, 2 nymphs, 5 km

NE of Las Canteras on rd to Anaga, 28°31'N 16°18'W, 700 m, 30.vi.1997 (DP 29). 7Γ, 12E, rd La Laguna to El Teide, Las Lagunetas, 28°25'N 16°25'W, 1400 m, 9.vii.1997 (DP 50). 4Γ, 6E, 3 nymphs, rd from La Laguna to El Teide, just abv Mirador de La Orotava, 28°24'N 16°25'30"W, 1590 m, 9.vii.1997 (DP 51). 4Γ, rd La Laguna to El Teide, c.20 m before turning to Arafo, 28°23'30"N 16°26'30"W, 1650 m, ex *Adenocarpus* hybrids, *viscosus* x *foliolosus*, 9.vii.1997 (DP 52). 5Γ, rd El Teide to Arafo 28°23'N 16°25'W, 1250 m, ex *Chamaecytisus proliferus*, 9.vii.1997 (DP 53). 31Γ, 16E, 8 nymphs, 3-5 km above Las Raíces, rd from La Laguna to Parque Nacional del Teide, 28°25'N 16°23'30"W, 1350 m, 11.iv.1998 (DP 156). 2Γ, 2E, Anaga, E of Pico del Inglés, 28°32'15"N 16°16'30"W, c. 960 m, ex *Teline canariensis*, 25.iv.1998 (DP 179). LA GOMERA: 112Γ, 72E, 30 nymphs, rd from Arure to Las Hayas, 28°7'30"N 17°18'30"W, 900 m, 13.vii.1997 (DP 67). 2Γ, 3E, as for previous except, ex *Chamaecytisus proliferus* (DP 68). 1E, as for previous except, ex *Spartocytisus filipes* (DP 69). 1Γ, 2E, as for previous except, ex *Retama monosperma* (DP 70). 30Γ, 30E, 23 nymphs, N coast road, nr Tamagarda and Las Rosas, 28°11'30"N 17°13'30"W, c. 600 m, ex *Adenocarpus* hybrids, *viscosus* x *foliolosus*, 26.v.1998 (DP 223). 1Γ, La Laguna Grande, Garajonay Park, 28°06'30"N 17°16'W, c. 1300 m, ex *Chamaecytisus proliferus*, 26.v.1998 (DP 224).

*Arytinnis proboscidea* (Loginova) **comb. nov.**

(Fig. 26D)

*Arytainilla proboscidea* Loginova, 1976: 18

*Adult Colour:* Generally bright green to mid-green though more mature males and females, but particularly females, develop brown to black colouration on the legs, abdomen and thorax. The darkest specimens were collected from the subalpine zone on La Palma. Head and genal cones with darkly pigmented setae. Forewing cells with faint brown patches, veins with long dark and short light bands.

*Adult Description:* Loginova (1976).

*Nymph*

*Colour:* 1<sup>st</sup>-3<sup>rd</sup> instars cream and orange, 4<sup>th</sup>-5<sup>th</sup> instars bright green and orange, with or without black tergites.

*Structure:* Antennal segments nine.

*5th instar measurements and ratios:* (specimens 8) BL: 1.55-1.88; BW: 0.98-1.15; WL: 0.56-0.62; CPL: 0.5-0.54; CPW: 0.66-0.73; RW: 0.17-0.19; RL: 0.11-0.11; HW: 0.68-0.75; AL: 1.01-1.1; AL3: 0.23-0.26. WBL: 0.58-0.64; ALHW: 1.35-1.57; ALWL: 1.65-1.93; WLHW: 0.75-0.86; WCPL: 1.31-1.4; CPRW: 3.58-4.12.

*5th instar chaetotaxy:* Head setae simple (max length at anterior margin 0.15-0.19); ocular seta simple, inconspicuous (max length 0.04-0.06); primary post-ocular seta simple (max length 0.12); secondary post-ocular seta simple (max length 0.14). Dorsal thoracic setae long simple (max length 0.1-0.15). Prominent wing pad setae max length 0.13-0.17; forewing and hindwing pads with simple setae, each pad with two prominent setae (occasionally slightly capitate), marginal (1 apical, 1 proximal); hindwing pad apical seta paired with small simple seta; small simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on anterior tergites, long simple (max length 0.15), prominent caudal plate setae present, six simple or narrowly capitate; sectasetae three pairs; marginal abdominal setae (other than sectasetae) three pairs, simple or narrowly capitate (max length 0.16-0.23); pleurite setae paired simple. Legs with simple setae only (max length 0.05).

*Host plant:* *Adenocarpus viscosus*, *A. foliolosus*.

*Distribution:* Canary Islands: Tenerife and La Palma.

*Notes:* Occurs on the two high islands, Tenerife and La Palma. On Tenerife it is restricted to the host plant *Adenocarpus viscosus* and also occurs on hybrids between *Adenocarpus viscosus* and *Adenocarpus foliolosus*. However, on La Palma it is the only species found on both *Adenocarpus* hosts, as the closely related *A. nigrilineata* is absent from this island. It is extremely abundant in the high sub-alpine zone on La Palma where adults can often be collected from sympatric plants, both leguminous and non-leguminous. This abundance on La Palma is correlated with a population explosion in the host plant after the preferential grazing of goats on other native plants reduced several species typical of this zone to near extinction (Palomares Martínez, 1997).

*Biology:* Eggs were observed in developing inflorescences in small clusters on the inner surface of bracts and calices and on the corolla, as well as on the inner surface of petioles in developing leaf buds. From 35 to more than 300 (on La Palma) eggs were found in a single inflorescence, the majority of these were laid on the calyx (more than 60 eggs were found on a single calyx and more than 40 eggs on a single corolla). Nymphs (1<sup>st</sup>-5<sup>th</sup> instars) were found in the same

locations. Some nymphs migrate to the base of the flower or the pedicel, while others congregate on unopened inflorescences or at the base of the stylar tube inside mature flowers. *Comment:* This study did not survey the eastern Canary Islands (Fuerteventura and Lanzarote), where there are no recorded host plants in the Genisteae, yet one male was recorded from Fuerteventura by Loginova (1976). Neither did this study corroborate Loginova's distributions for La Gomera (one  $\Gamma$  recorded) or Gran Canaria (one E recorded). Loginova (1976) grouped this and the previous species (*A. nigrilineata*) together with *A. dividens* and *A. modica* based on the extremely large, elongate female genitalia. However, in other respects the adult and nymphal forms in these two groups are distinct. *A. proboscidea* and *A. nigrilineata* are the only *Adenocarpus*-feeding species in the Canary Islands and they share several unique features such as banded forewing veins, long distal proboscis segment and 5<sup>th</sup> instars nymphs with nine antennal segments.

*Material examined:* (ex *Adenocarpus viscosus* unless otherwise stated) CANARY ISLANDS. TENERIFE: 50 $\Gamma$ , 50E, 5 nymphs, rd to Parque Nacional del Teide, Miradores de la Cumbre, 28°23'30"N 16°26'W, 1800 m, 22.vi.1997 (DP 5). 36 $\Gamma$ , 14E, 17 nymphs, c.14 km S of Aguamansa, rd Aguamansa to El Teide, 28°19'N 16°33'30"W, 1200 m, 29.vi.1997 (DP 24). 56 $\Gamma$ , 50E, 18 nymphs, rd Parque Nacional del Teide to Santiago del Teide, 28°15'30"N 16°46'W, 1130 m, 29.vi.1997 (DP 27). 1 $\Gamma$ , rd from La Laguna to El Teide, just abv Mirador de La Orotava, 28°24'N 16°25'30"W, 1590 m, ex *Adenocarpus foliolosus*, 9.vii.1997 (DP 51). 5 $\Gamma$ , rd La Laguna to El Teide, c.20 m before turning to Arafo, 28°23'30"N 16°26'30"W, 1650 m, ex *Adenocarpus* hybrids, *viscosus* x *foliolosus*, 9.vii.1997 (DP 52). 14 $\Gamma$ , 16E, 12 nymphs, abv Roques Imoque and Brezo, nr Trevejos, rd from Arona to Vilaflor, 28°29'15"N 16°39'15"W, c. 1300 m, 10.v.1998 (DP 187). 2 $\Gamma$ , 2E, abv Vilaflor, 28°10'30"N 16°39'W, c. 1900 m, ex *Chamaecytisus proliferus*, 10.v.1998 (DP 188). LA PALMA: 4 $\Gamma$ , 6E, 1 nymph, SE rd Santa Cruz to La Caldera 28°43'N 17°46'W, 950 m, ex *Adenocarpus foliolosus*, 15.vii.1997 (DP 72). 36 $\Gamma$ , 24E, 47 nymphs, SE rd Santa Cruz to La Caldera, 28°43'N 17°47'30"W, 1500 m, 15.vii.1997 (DP 74). 11 $\Gamma$ , 22E, 2 nymphs, as for previous except, ex *Adenocarpus foliolosus* (DP 75). 17 $\Gamma$ , 7E, 108 nymphs, La Palma, Fuente de Olén, SE rd Santa Cruz to La Caldera, 28°43'30"N 17°48'W, 1730 m, 15.vii.1997 (DP 76). 5 $\Gamma$ , 9E, La Palma, SE rd Santa Cruz to La Caldera, 28°45'N 17°49'30"W, 1950 m, ex *Spartocytisus supranubius*, 16.vii.1997 (DP 80.1). 3 $\Gamma$ , La Caldera, 2150 m, ex *Spartocytisus supranubius*, 16.vii.1997 (DP 80.2). 5 $\Gamma$ , 16E, La

Caldera, 28°45'N 17°50'30"W, 2250 m, ex *Genista benehoavensis*, 16.vii.1997 (DP 81). 2Γ, 1E, La Caldera, 28°46'N 17°50'30"W, 2280 m, ex *Spartocytisus supranubius*, 17.vii.1997 (DP 85). 8Γ, 3E, La Palma, La Caldera, 28°45'30"N 17°51'W, 2270 m, ex *Genista benehoavensis*, 17.vii.1997 (DP 86). 4Γ, 5E, 5 nymphs, NE, rd Barlovento to Garafia, nr Gallegos, 28°48'N 17°52'W, c. 600 m, ex *Adenocarpus viscosus* and hybrids with *A. foliolosus*, 19.v.1998 (DP 199). 1Γ, NW rd from Llano Negro to La Caldera, 28°48'N 17°55'30"W, c. 1050 m, ex *Chamaecytisus proliferus*, 19.v.1998 (DP 201). 10Γ, 18E, Roque de los Muchachos, 28°45'30"N 17°53'W, c. 2300 m, ex *Genista benehoavensis*, 19.v.1998 (DP 202). 27Γ, 15E, 15 nymphs, La Palma, SE rd Santa Cruz to La Caldera, 28°43'N 17°47'15"W, c. 1100 m, ex *Adenocarpus foliolosus*, 20.v.1998 (DP 204). 3Γ, 1E, SE rd Santa Cruz to La Caldera, 28°43'30"N 17°48'30"W, c. 1700 m, ex *Chamaecytisus proliferus*, 20.v.1998 (DP 205). 5Γ, 4E, as for previous except, ex *Spartocytisus supranubius* (DP 206). 40Γ, 40E, La Caldera rim, NW of Pico de la Cruz, 28°45'30"N 17°51'W, c. 2200 m, 20.v.1998 (DP 209). 20Γ, 15E, as for previous except, ex *Genista benehoavensis* (DP 207). 7Γ, 10E, as for previous except, ex *Spartocytisus supranubius* (DP 208).

*Arytinnis equitans* (Loginova) **comb. nov.**

(Figs 28D & 30D)

*Arytainilla equitans* Loginova, 1976: 25

*Adult Colour*: Pale grey-green, mature specimens becoming darker; forewing cells with faint brown patches apically, veins uniform mid-brown.

*Adult Description*: Loginova (1976).

*Nymph*

*Colour*: 1<sup>st</sup>-2<sup>nd</sup> instars orange-red with black tergites, 3<sup>rd</sup>-5<sup>th</sup> instars cream or green with black tergites.

*Structure*: Antennal segments seven.

*5th instar measurements and ratios*: (specimens 5) BL: 1.45-1.83; BW: 0.93-1.05; WL: 0.49-0.54; CPL: 0.42-0.47; CPW: 0.61-0.68; RW: 0.18-0.2; RL: 0.11-0.11; HW: 0.66-0.72; AL: 0.97-1.05; AL3: 0.22-0.26. WBL: 0.57-0.64; ALHW: 1.38-1.59; ALWL: 1.91-2.02; WLHW: 0.71-0.79; WCPL: 1.38-1.51; CPRW: 3.39-3.61.



*5th instar chaetotaxy:* Head setae simple (max length at anterior margin 0.11-0.17); ocular seta simple, dark, conspicuous (max length 0.08-0.11); primary and secondary post-ocular setae simple or narrowly, to distinctly capitate (max length 0.09-0.12). Dorsal thoracic setae long, simple only or with capitate (max length 0.1-0.12). Prominent wing pad setae max length 0.12-0.15; forewing and hindwing pads with simple and capitate setae, prominent setae two on each pad, marginal (1 apical, 1 proximal) apical seta distinctly capitate, proximal seta distinctly capitate or simple; forewing pad with up to five smaller marginal simple or rod setae; hindwing pad apical seta paired with small simple seta; small simple or rod setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on anterior tergites, long capitate (max length 0.1-0.12), prominent caudal plate setae absent or if present, typically two distinctly capitate; sectasetae three pairs (small simple or lanceolate seta in 1<sup>st</sup> position); marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate (max length 0.12-0.16); pleurite setae paired capitate and simple. Legs with simple setae only or with capitate setae present (max length 0.03-0.07); capitate fore and middle leg setae absent (occasionally small rod setae proximally); capitate hind leg setae absent or if present, on tibia only, one (proximal) capitate or small rod.

*Host plant:* *Teline microphylla*, *T. canariensis*.

*Distribution:* Canary Islands: Gran Canaria.

*Notes:* Widespread throughout the distribution of the host plant, *Teline microphylla*. Two sympatric species, *A. diluta* and *A. prognata*, appear to be restricted to humid or more drier habitats respectively. During this study these two species were never found on the same host populations, however, Loginova (1975) records two locations (though no host details are given) where *A. diluta*, *A. prognata* and *A. equitans* were collected. A few adults and nymphs of *A. equitans* were also collected from relict individuals of the host plant, *Teline canariensis*, in the reduced laurisilva habitat on Gran Canaria. Host acquisition in this instance, may have been facilitated by hybridization which has been recorded between *Teline microphylla* and *Teline canariensis* on Gran Canaria (M. del Arco Aguilar pers. comm.).

*Biology:* Eggs were found on the outer surface of corolla segments. Small nymphs (1<sup>st</sup>-2<sup>nd</sup> instars) were observed on corollas, new leaves and developing fruit, usually under the persistent calyx and anther tube.

*Material examined:* CANARY ISLANDS. GRAN CANARIA: 45♂, 39E, 18 nymphs, 1-2 km S of Cruz de Tejeda, 27°59'30"N 15°36'W, 1480 m, ex *Teline microphylla*, 5.vii.1997 (DP 35). 1E, abv Fataga, 27°54'30"N 15°34'W, 800 m, ex *Teline microphylla*, 6.vii.1997 (DP 40). 3♂, 4E, 2 nymphs, rd Moya to Fontanales, 28°5'30"N 15°35'W, c. 600 m, ex *Teline canariensis*, 6.vii.1997 (DP 41). 1E, just blw Pinos de Gáldar, 28°2'30"N 15°37'30"W, 1400 m, ex *Teline microphylla*, 6.vii.1997 (DP 44). 1♂, 1E, just abv Pinos de Gáldar, 28°2'N 15°37'W, 1500 m, ex *Teline microphylla*, 6.vii.1997 (DP 45). 1E, 1 nymph, rd Ayacata to Tejeda, 27°57'30"N 15°38'S, 1370 m, ex *Teline microphylla*, 7.vii.1997 (DP 48). 6♂, 12E, c. 5 km S of Moya on rd to San Bartolomé de Fontanales, 28°5'N 15°35'30"W, c. 800 m, ex *Teline stenopetala*, 15.iv.1998 (DP 158). 3E, 1 nymph, abv Fataga, 27°54'N 15°34'W, c. 800 m, ex *Teline microphylla*, 16.iv.1998 (DP 160). 1E, S of Risco Blanco, 27°56'N 15°33'30"W, c. 900 m, ex *Teline rosmarinifolia*, 16.iv.1998 (DP 162). 39♂, 55E, 16 nymphs, rd to Risco Blanco, btw Agualatente and La Culata, 27°56'N 15°34'W, 1100 m, ex *Teline microphylla*, 16.iv.1998 (DP 163). 2E, base of Risco Blanco, 27°56'N 15°33'30"W, 1150 m, ex *Teline rosmarinifolia*, 18.iv.1998 (DP 165). 1E, rd Moya to St Bartolome de Fontanales, 28°5'30"N 15°35'W, c. 600 m, ex *Teline canariensis*, 19.iv.1998 (DP 171). 13♂, 22E, 1 km N of Cruz de Tejeda, 28°30'N 15°35'30"W, c. 1500 m, ex *Teline microphylla*, 20.iv.1998 (DP 172). 47♂, 32E, 2 nymphs, 1-2 km S of Cruz de Tejeda, 28°00'N 15°36'W, 1420 m, ex *Teline microphylla*, 20.iv.1998 (DP 175).

*Arytinnis prognata* (Loginova) **comb. nov.**

(Fig. 26A)

*Arytainilla prognata* Loginova, 1976: 28

*Adult Colour:* Mid-green to yellow green; forewing clear, veins uniform light brown.

*Adult Description:* Loginova (1976).

*Nymph*

*Colour:* 1<sup>st</sup>-2<sup>nd</sup> instars orange-red with black tergites, 3<sup>rd</sup>-5<sup>th</sup> instars bright green, grey-green or cream, with or without black tergites.

*Structure:* Antennal segments seven.

*5th instar measurements and ratios:* (specimens 5) BL: 1.35-2.03; BW: 0.85-1.08; WL: 0.5-0.54; CPL: 0.42-0.49; CPW: 0.57-0.67; RW: 0.16-0.18; RL: 0.1-0.11; HW: 0.57-0.67; AL: 0.82-0.9; AL3: 0.19-0.22. WBL: 0.53-0.63; ALHW: 1.22-1.5; ALWL: 1.58-1.7; WLHW: 0.75-0.93; WCPL: 1.3-1.38; CPRW: 3.17-3.82.

*5th instar chaetotaxy:* Head setae simple (max length at anterior margin 0.11-0.14); ocular seta simple, dark, conspicuous (max length 0.05-0.07); primary post-ocular seta narrowly or distinctly capitate (max length 0.08-0.09); secondary post-ocular seta simple (max length 0.03-0.06). Dorsal thoracic setae short with few long, simple (max length 0.07). Prominent wing pad setae max length 0.09-0.12; forewing and hindwing pads with simple and capitate setae; each pad with one prominent apical seta, distinctly capitate; hindwing pad apical seta paired with small simple seta; proximal setae indistinct from small simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae on anterior tergites, long simple (max length 0.09), prominent caudal plate setae absent; sectasetae four pairs; marginal abdominal setae (other than sectasetae) one pair (1<sup>st</sup> position), distinctly capitate (max length 0.1-0.14); pleurite setae paired simple, occasionally slightly capitate. Legs with simple setae only (max length 0.05).

*Host plant:* *Teline microphylla*.

*Distribution:* Canary Islands: Gran Canaria.

*Notes:* In this study, *A. prognata* was found to be restricted to southern populations of the host plant where the habitat is xerophytic. In all cases it was found to be sympatric with *A. equitans* and in April, more abundant than this species on the most southerly host population sampled. However, it was absent from collections made from this same host population later in July, when only *A. equitans* was found. This suggests that these species may exhibit asynchronous development with *A. prognata* developing earlier than *A. equitans*.

*Biology:* Small nymphs were observed on the corolla and larger nymphs on the pedicel of developing flowers.

*Material examined:* CANARY ISLANDS. GRAN CANARIA: 14Γ, 13E, 19 nymphs, abv Fataga, 27°54'N 15°34'W, c. 800 m, ex *Teline microphylla*, 16.iv.1998 (DP 160). 2Γ, 8 nymphs, rd to Risco Blanco, btw Agualente and La Culata, 27°56'N 15°34'W, 1100 m, ex *Teline*

*microphylla*, 16.iv.1998 (DP 163). 1Γ, base of Risco Blanco, 27°56'N 15°33'30"W, 1150 m, ex *Teline rosmarinifolia*, 18.iv.1998 (DP 165).

*Arytinnis diluta* (Loginova) **comb. nov.**

(Figs 26B & 30C)

*Arytainilla diluta* Loginova, 1976: 24

*Adult Colour*: Yellow-green to yellow-brown, mature specimens become darker brown; genal cones with darkly pigmented setae. Forewing cells with faint brown patches apically, veins uniform mid- or dark brown.

*Adult Description*: Loginova (1976).

*Nymph*

*Colour*: 5<sup>th</sup> instars bright green to yellow or cream, with black tergites.

*Structure*: Antennal segments seven.

*5th instar measurements and ratios*: (specimens 2) BL: 1.5-1.68; BW: 1.03-1.08; WL: 0.5-0.52; CPL: 0.42-0.42; CPW: 0.61-0.67; RW: 0.14-0.15; HW: 0.64-0.66; AL: 0.84-0.86; AL3: 0.2-0.21. WBL: 0.64-0.69; ALHW: 1.27-1.34; ALWL: 1.62-1.72; WLHW: 0.78-0.79; WCPL: 1.45-1.6; CPRW: 4.36-4.47.

*5th instar chaetotaxy*: Head setae simple (max length at anterior margin 0.15-0.16); ocular seta simple, dark, conspicuous (max length 0.05-0.08); primary and secondary post-ocular setae simple (max length 0.06-0.07). Dorsal thoracic setae short simple (max length 0.02-0.04). Prominent wing pad setae max length 0.12; forewing and hindwing pads with simple setae only, forewing pad with one prominent apical seta and up to eight smaller marginal setae; hindwing pad with one prominent apical seta (paired with one smaller); proximal setae indistinct from small simple setae on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on posterior tergites, long simple (max length 0.08-0.1), prominent caudal plate setae present, 6-8, simple; sectasetae four pairs; marginal abdominal setae (other than sectasetae) four pairs, simple (max length 0.15-0.19); pleurite setae paired simple. Legs with simple setae only (max length 0.05).

*Host plant*: *Teline microphylla*, *T. canariensis*.

*Distribution*: Canary Islands: Gran Canaria and Tenerife.

*Notes:* On Gran Canaria *A. diluta* was found to be restricted to northern populations of the host plant (*Teline microphylla*) where the habitat is more humid. In all cases it was found to be sympatric with *A. equitans* and in April, more abundant than this species on the most northerly host population sampled. However, it was absent from collections made from the same host population later in July when only *A. equitans* was found. This suggests that these two species may exhibit asynchronous development with *A. diluta* (as with *A. prognata*) developing earlier than *A. equitans*. On Tenerife *A. diluta* is sympatric with *A. pileolata*, but similarly found to be restricted to more humid habitats of the host plant (*Teline canariensis*) on the Anaga and Teno peninsulas. It also appears to develop earlier than *A. pileolata*, being absent or rare from collections made in June but common from the same locations in April-May.

*Biology:* Nymphs were observed on leaf buds.

*Material examined:* CANARY ISLANDS. GRAN CANARIA: 61♂, 50♀, 1 km N of Cruz de Tejada, 28°30'N 15°35'30"W, c. 1500 m, ex *Teline microphylla*, 20.iv.1998 (DP 172). 9♂, 28♀, 1 nymph, 1-2 km S of Cruz de Tejada, 28°00'N 15°36'W, 1420 m, ex *Teline microphylla*, 20.iv.1998 (DP 175). TENERIFE: 1♂, 1♀, 3 nymphs, rd Buenavista to Santiago del Teide, N of turning to Los Carrizales, 28°19'N 16°50'30"W, 900 m, ex *Teline canariensis*, 28.vi.1997 (DP 21). 13♂, 17♀, 1 nymph, Teno, 7 km S of Buenavista on rd to Santiago del Teide, 28°20'N 16°51'W, c. 800 m, ex *Teline canariensis*, 4.iv.1998 (DP 152). 1♂, 4♀, Anaga, E of Pico del Inglés, 28°32'15"N 16°16'30"W, c. 960 m, ex *Teline canariensis*, 25.iv.1998 (DP 179). 15♂, 15♀, Anaga, E of El Bailadero, 28°33'15"N 16°10'30"W, c. 800 m, ex *Teline canariensis*, 1.v.1998 (DP 183).

***Arytinnis romeria* sp. nov. (5)**

(Figs 7, 29B & 1N)

*Adult*

*Colour:* Yellow-green; forewing clear, veins uniform light brown.

*Structure:* Surface forewing spinules present in all cells but reduced in cell c+sc; distribution of spinules non-uniform, medium density: 40-60 per 0.1mm<sup>2</sup>; apical spines in wing cells cu<sub>1</sub>, m<sub>1</sub> and m<sub>2</sub>, and absent, or more typically few present in cell r<sub>2</sub>. Antennae short; genal cones very short, terminal setae not darkly pigmented. Distal proboscis segment mid-length. Paramere

short, in lateral view slender and simple, with sides tapering towards the apex, sclerotized apex dorsally rounded with small anteriorly and interiorly directed hook, in dorsal view contiguous anteriorly and rounded with an acute point; proctiger not inflated posteriorly towards the base; aedeagus distal segment with a flattened, shallow hook, tip of aedeagus hook blunt; male subgenital plate dorsal profile more or less straight and horizontal. Female proctiger dorsal profile more or less straight from anus to apex or with slight post anal depression; subgenital plate ventral profile shallowly curved.

*Adult measurements and ratios:* (4 $\Gamma$ , 5E) total length:  $\Gamma$  2.64-2.84, E 2.96-3.16; forewing:  $\Gamma$  length 2.2-2.25 width 0.89-0.93, E length 2.25-2.45 width 0.93-0.99; pterostigma length  $\Gamma$  0.64-0.77, E 0.7-0.85; hindwing length  $\Gamma$  1.78-1.8, E 1.83-2; head width:  $\Gamma$  0.75-0.77, E 0.77-0.81; antennal length: 1.1-1.27; genal cone length: 0.08-0.11; distal proboscis segment length: 0.16-0.18. WLPT: 2.84-3.36; ALHW: 1.47-1.62; GCVL: 0.4-0.58; WLHW: 2.86-3.18; VLW: 0.39-0.48; WLW: 2.37-2.53; CUR: 1.59-1.84; MR: 0.43-0.53; RMCU: 5-7.05; TLFL: 1.06-1.16; TLHW: 0.61-0.68; SCHW: 0.79-0.87; ATIB: 0.25-0.28; MTIB: 0.27-0.31; PBHW: 0.21-0.22; ATMT: 0.87-0.93. *Adult genitalia*  $\Gamma$ : MP: 0.22-0.23; PL: 0.3-0.31; AEL: 0.23-0.24; AEH: 0.06-0.07. MPHW: 0.29-0.31; PLHW: 0.4-0.41; MPPL: 0.71-0.77; AEPL: 0.74-0.8; MSLH: 1.21-1.31; AHS: 0.27-0.28; PLSH: 1.11-1.15. E: FP: 0.67-0.72; FSP: 0.42-0.49; RL: 0.18-0.21; OV: 0.13-0.14; EL: 0.25-0.29. FPHW: 0.87-0.94; FPSP: 1.47-1.6; FPCR: 3.43-3.74; OLSP: 0.27-0.31; FEOL: 2.01.

### *Nymph*

*Colour:* 1<sup>st</sup>-3<sup>rd</sup> instars orange-red with black tergites, 4<sup>th</sup>-5<sup>th</sup> instars mid-green.

*Structure:* Antennal segments seven.

*5th instar measurements and ratios:* (specimens 4) BL: 1.35-1.63; BW: 0.93-1; WL: 0.52-0.53; CPL: 0.38-0.46; CPW: 0.63-0.67; RW: 0.16-0.19; RL: 0.11-0.11; HW: 0.61-0.64; AL: 0.72-0.78; AL3: 0.17-0.2. WBL: 0.61-0.7; ALHW: 1.16-1.28; ALWL: 1.38-1.5; WLHW: 0.83-0.85; WCPL: 1.46-1.66; CPRW: 3.5-4.06.

*5th instar chaetotaxy:* Head setae simple and narrowly capitate (max length at anterior margin 0.1-0.11); ocular seta simple, inconspicuous (max length 0.04-0.05); primary post-ocular seta distinctly capitate (max length 0.07); secondary post-ocular seta distinctly or narrowly capitate (max length 0.05-0.06). Dorsal thoracic setae short simple (max length 0.04-0.05). Prominent wing pad setae max length 0.1-0.11; forewing and hindwing pads with capitate setae only

(minute simple setae scattered on the wing pad surfaces); forewing pad prominent setae 7-10, distinctly capitate, marginal (4-5 larger, 3-5 smaller), proximal seta short simple or narrowly capitate; hindwing pad with one prominent apical seta, distinctly capitate, paired with one small rod seta, proximal seta indistinct from simple surface setae. Dorsal abdominal prominent pre-caudal setae present on anterior tergites, short simple and capitate (max length 0.05), prominent caudal plate setae absent; sectasetae four pairs; marginal abdominal setae (other than sectasetae) three pairs (4<sup>th</sup> may be reduced, simple or absent), distinctly capitate (max length 0.12-0.13); pleurite setae paired capitate and simple. Legs with capitate setae present (max length 0.1-0.11); capitate foreleg setae absent; capitate middle and hind leg setae present, on tibia only, one (distal).

*Host plant:* *Teline rosmarinifolia* ssp. *rosmarinifolia*.

*Distribution:* Canary Islands: Gran Canaria.

*Notes:* The host plant has a southern distribution on Gran Canaria and survives in small, isolated populations but was recently found to be more widespread than previously thought (Marrero, González-Artiles & González-Martín, 1995). Two subspecies of the host have been recognised but only one was sampled. *A. romeria* sp. nov. was found on only one of the two host populations sampled which suggests that size and fragmentation of host populations may effect this species' distribution.

*Biology:* Eggs were found scattered on the surface of fruits, at the base of leaflets and on the underside of leaves. Nymphs were observed on the corolla of developing flowers and on developing fruit under the persistent calyx and anther tube.

*Etymology:* Named both for the harvest festivals ('romería') celebrated at the time this species was discovered, and for the likeness of the foliage of the host plant (*Teline rosmarinifolia*) to 'rosemary' or 'romero' in Spanish.

*Type material:* Holotype ♂ (slide mounted), CANARY ISLANDS. GRAN CANARIA: base of Risco Blanco, 27°56'N 15°33'30"W, 1150 m, 18.iv.1998 (BMNH). Paratypes 2♂, 3E, 6 nymphs, as for holotype (BMNH). 1♂, 1E, as for holotype (DZUL). 2♂, 2E, as for holotype (NHMB).

*Other material examined:* 12♂, 17E, as for holotype (DP 165).

*Arytinnis fortunata* sp. nov. (6)

(Figs 8, 29A &amp; 30F)

*Adult*

*Colour:* Pale green to mid-green; forewing clear, veins uniform light brown.

*Structure:* Surface forewing spinules present throughout all cells, but reduced cell c+sc; distribution of spinules non-uniform, medium density: 40-60 per 0.1mm<sup>2</sup>; apical spines in wing cells cu<sub>1</sub>, m<sub>1</sub> and m<sub>2</sub>, and few present in cell r<sub>2</sub>. Antennae mid-length; genal cones short, terminal setae not darkly pigmented. Distal proboscis segment mid-length. Paramere short, in lateral view slender and simple, with sides tapering towards the apex, sclerotized apex dorsally rounded with very small anteriorly directed hook, in dorsal view contiguous anteriorly, inner margin straight edged; proctiger not inflated towards the base; aedeagus distal segment with a flattened, shallow hook, tip of aedeagus hook blunt; male subgenital plate dorsal profile more or less straight and horizontal. Female proctiger dorsal profile more or less straight from anus to apex; subgenital plate ventral profile shallowly curved.

*Adult measurements and ratios:* (4Γ, 5E) total length: Γ 2.92-3.12, E 3-3.44; forewing: Γ length 2.33-2.5 width 0.93-1.03, E length 2.39-2.76 width 0.97-1.1; pterostigma length Γ 0.82-0.89, E 0.8-0.98; hindwing length Γ 1.93-2, E 1.95-2.25; head width: Γ 0.77-0.79; E 0.76-0.83; antennal length: 1.52-1.71; genal cone length: 0.1-0.13; distal proboscis segment length: 0.14-0.15. WLPT: 2.75-2.99; ALHW: 2-2.14; GCVL: 0.45-0.65; WLHW: 2.99-3.37; VLW: 0.4-0.49; WLW: 2.38-2.53; CUR: 1.79-1.93; MR: 0.47-0.54; RMCU: 4.83-6.21; TLFL: 1.13-1.21; TLHW: 0.72-0.77; SCHW: 0.79-0.85; ATIB: 0.25-0.29; MTIB: 0.27-0.29; PBHW: 0.18-0.19; ATMT: 0.94-1.06. *Adult genitalia* Γ: MP: 0.26-0.27; PL: 0.36-0.37; AEL: 0.24-0.25; AEH: 0.07-0.08. MPHW: 0.33-0.35; PLHW: 0.46-0.48; MPPL: 0.72-0.75; AEPL: 0.65-0.69; MSLH: 1.19-1.3; AHS: 0.3-0.31; PLSH: 1.13-1.2. E: FP: 0.61-0.72; FSP: 0.4-0.44; RL: 0.19-0.23; OV: 0.13-0.14; EL: 0.24-0.28. FPHW: 0.8-0.87; FPSP: 1.53-1.64; FPCR: 3.09-3.35; OLSP: 0.3-0.33; FEOL: 1.97.

*Nymph*

*Colour:* 1<sup>st</sup>-2<sup>nd</sup> instars orange and cream, 5<sup>th</sup> instars bright green.

*Structure:* Antennal segments seven.

*5th instar measurements and ratios:* Specimens 4; BL: 1.5-1.98; BW: 1-1.18; WL: 0.56-0.6; CPL: 0.41-0.56; CPW: 0.64-0.73; RW: 0.18-0.19; RL: 0.11-0.11; HW: 0.65-0.71; AL: 0.9-0.94;



AL3: 0.2-0.23. WBL: 0.6-0.69; ALHW: 1.3-1.42; ALWL: 1.55-1.64; WLHW: 0.83-0.9; WCPL: 1.3-1.56; CPRW: 3.56-3.84.

*5th instar chaetotaxy:* Head setae simple (max length at anterior margin 0.12-0.13); ocular seta simple, inconspicuous (max length 0.04-0.05); primary post-ocular seta distinctly or occasionally narrowly capitate (max length 0.07-0.08); secondary post-ocular seta simple (max length 0.06). Dorsal thoracic setae short simple (max length 0.03-0.05). Prominent wing pad setae max length 0.1-0.12; forewing and hindwing pads with simple and capitate setae; forewing pad with 9-11 prominent setae, marginal, 3-5 larger distinctly capitate and up to 6 smaller narrowly capitate or simple; hindwing pad with two prominent apical setae, distinctly capitate; proximal setae short simple; small simple or rod setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on anterior tergites, short simple (max length 0.06), prominent caudal plate setae absent; sectasetae four pairs; marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate (max length 0.13-0.15); pleurite setae paired capitate and simple. Legs with capitate setae present (max length 0.12-0.13); capitate foreleg setae absent; capitate middle leg setae present on tibia only, one (distal); capitate hind leg setae present on femur and tibia or tibia only (femur seta either capitate or simple), on the tibia 3 (1 larger distal, 2 smaller proximal and occasionally up to 2 small rod setae).

*Host plant:* *Teline splendens*.

*Distribution:* Canary Islands: La Palma.

*Notes:* The host plant distribution is restricted, found only locally in laurisilva habitat, however, *A. fortunata* sp. nov. was relatively abundant in all locations sampled. This is one of two occurrences where a single psyllid species is associated with a single host species, and both psyllid and host plant are endemic to a single island. The other is *A. romeria* sp. nov. on the host plant *T. rosmarinifolia* on Gran Canaria.

*Biology:* Eggs were found sparsely scattered on both sides of young leaves but mostly on the glaucous underside, and also scattered on fruit, towards the apex. Small nymphs (1<sup>st</sup>-2<sup>nd</sup> instars) were observed on leaf buds and fruit usually under the persistent calyx. Large nymphs (3<sup>rd</sup>-5<sup>th</sup> instars) were found in flowers, inside the anther tube on the developing ovary.

*Etymology:* Named for the ancient reference to the Canary Islands - Fortunatae Insulae - as the 'Fortunate Islands' and also because this species occurs on one of the most attractive species of *Teline*, *T. splendens*.

*Type material:* Holotype ♂ (slide mounted), CANARY ISLANDS. LA PALMA: SE rd Santa Cruz to La Caldera, 28°42'45"N 17°46'W, c. 600 m, 20.v.1998 (BMNH). Paratypes 2♂, 3♀, 10 nymphs, as for holotype (BMNH). 2♂, 1♀, 5 nymphs, as for holotype (DZUL). 3♂, 2♀, 5 nymphs, as for holotype (NHMB).

*Other material examined:* CANARY ISLANDS. LA PALMA: 22♂, 14♀, 25 nymphs, SE rd Santa Cruz to La Caldera 28°42'30"N 17°46'W, 790 m, 16.vii.1997 (DP 78). 52♂, 54♀, 31 nymphs, as for holotype (DP 203).

***Arytinnis canariensis* sp. nov. (7)**

(Figs 9 & 1M)

*Adult*

*Colour:* Mid-green to yellow-green, head and genal cones with darkly pigmented setae; forewing clear, veins uniform mid-brown.

*Structure:* Surface forewing spinules present but reduced in all cells, or if absent, only from cell c+sc; distribution of spinules uniform, sparse: less than 40 per 0.1mm<sup>2</sup>; apical spines in wing cells cu<sub>1</sub>, m<sub>1</sub> and m<sub>2</sub>, and in cell r<sub>2</sub> but not to the margin. Antennae mid-length; genal cones very short, terminal setae darkly pigmented. Distal proboscis segment long. Paramere short, in lateral view with an apically thin neck above a medially positioned blade produced on the external side and directed anteriorly, sclerotized apex dorsally rounded with slight anterior and posterior projections, in dorsal view contiguous posteriorly with the inner margin straight edged; proctiger not inflated towards the base; aedeagus distal segment with a flattened, shallow hook, tip of aedeagus hook blunt; male subgenital plate dorsal profile more or less straight and horizontal, or slightly raised anteriorly. Female proctiger dorsal profile more or less straight from anus to apex; subgenital plate ventral profile shallowly curved; egg with stout lateral pedicel at the base.

*Adult measurements and ratios:* (3♂, 3♀) total length: ♂ 2.64-2.92, ♀ 2.88-3.4; forewing: ♂ length 2.18-2.3 width 0.91-0.98, ♀ length 2.35-2.68 width 1.03-1.13; pterostigma length ♂ 0.65-0.74, ♀ 0.73-0.94; hindwing length ♂ 1.8-1.85, ♀ 1.9-2.18; head width: ♂ 0.72-0.77, ♀ 0.77-0.82; antennal length: 1.5-1.65; genal cone length: 0.06-0.08; distal proboscis segment length: 0.2-0.25. WLPT: 2.85-3.35; ALHW: 2-2.17; GCVL: 0.3-0.42; WLHW: 2.92-3.31; VLW: 0.41-

0.48; WLW: 2.28-2.4; CUR: 1.75-2.08; MR: 0.47-0.58; RMCU: 4.31-5.33; TLFL: 1.31-1.39; TLHW: 0.94-1.01; SCHW: 0.81-0.92; ATIB: 0.18-0.21; MTIB: 0.22-0.26; PBHW: 0.28-0.32; ATMT: 0.78-0.89. *Adult genitalia*  $\Gamma$ : MP: 0.33-0.35; PL: 0.38-0.39; AEL: 0.27-0.28; AEH: 0.09-0.10. MPHW: 0.43-0.47; PLHW: 0.5-0.53; MPPL: 0.87-0.9; AEPL: 0.69-0.74; MSLH: 1.15-1.26; AHS: 0.34-0.35; PLSH: 1.18-1.23. E: FP: 0.73-0.81; FSP: 0.48-0.55; RL: 0.19-0.23; OV: 0.15; EL: 0.25-0.29. FPHW: 0.95-0.99; FPSP: 1.47-1.52; FPCR: 3.3-3.84; OLSP: 0.27-0.31; FEOL: 1.8.

*Nymph* Unknown

*Host plant*: *Teline canariensis*.

*Distribution*: Canary Islands: Tenerife.

*Notes*: Known from only one location despite extensive sampling of the relatively widespread host plant. This species was discovered in the laurisilva habitat of the Anaga peninsula, occurring sympatrically with *A. pileolata*, *A. menceyata* sp. nov. and *A. diluta*, and was the most common species in this particular location.

*Etymology*: Named for the Canary Islands and for the host plant, *Teline canariensis*.

*Type material*: Holotype  $\Gamma$  (slide mounted), CANARY ISLANDS. TENERIFE: Anaga, E of Pico del Inglés, 28°32'15"N 16°16'30"W, c. 960 m, 25.iv.1998 (BMNH). Paratypes 1 $\Gamma$ , 1E, as for holotype (BMNH). 1 $\Gamma$ , 1E, as for holotype (DZUL). 1 $\Gamma$ , 1E, as for holotype (NHMB).

*Other material examined*: 11 $\Gamma$ , 9E, as for holotype (DP 179).

### ***Arytinnis menceyata* sp. nov. (8)**

(Figs 10 & 29C)

#### *Adult*

*Colour*: Mid-green to yellow-green; forewing clear, veins uniform light brown.

*Structure*: Surface forewing spinules present in all cells but reduced in cell c+sc, distribution of spinules non-uniform, dense: 60-100 per 0.1mm<sup>2</sup>; apical spines in wing cells cu<sub>1</sub>, m<sub>1</sub> and m<sub>2</sub>, but absent from cell r<sub>2</sub>. Antennae short; genal cones very short, terminal setae not darkly pigmented. Distal proboscis segment mid-length. Paramere long, in lateral view with an

apically thin neck above a medially positioned blade produced on the external side and directed anteriorly, sclerotized apex dorsally flattened, with slight anterior and posterior projections, in dorsal view contiguous posteriorly with inner margin concave; proctiger not inflated towards the base; aedeagus distal segment with a well developed, curved hook, tip of aedeagus hook acute, not, or only slightly turning upwards; male subgenital plate dorsal profile raised anteriorly with a distinct step. Female proctiger dorsal profile more or less straight from anus to apex; subgenital plate ventral profile shallowly curved.

*Adult measurements and ratios:* (3 $\Gamma$ , 3E) total length:  $\Gamma$  2.6-2.84, E 2.8-3; forewing:  $\Gamma$  length 2.13-2.2 width 0.88-0.93, E length 2.35-2.4 width 0.98-1; pterostigma length  $\Gamma$  0.69-0.72, E 0.8-0.86; hindwing length  $\Gamma$  1.8-1.85, E 2-2.05; head width:  $\Gamma$  0.71-0.72, E 0.73-0.75; antennal length: 1.23-1.35; genal cone length: 0.08-0.1; distal proboscis segment length: 0.16-0.17. WLPT: 2.73-3.14; ALHW: 1.66-1.88; GCVL: 0.38-0.56; WLHW: 2.99-3.24; VLW: 0.41-0.5; WLW: 2.37-2.42; CUR: 1.57-1.81; MR: 0.42-0.49; RMCU: 5.92-7.05; TLFL: 1.18-1.26; TLHW: 0.77-0.82; SCHW: 0.8-0.91; ATIB: 0.24-0.26; MTIB: 0.24-0.25; PBHW: 0.21-0.23; ATMT: 1-1.07. *Adult genitalia*  $\Gamma$ : MP: 0.33-0.37; PL: 0.58-0.59; AEL: 0.36; AEH: 0.08-0.09. MPHW: 0.46-0.51; PLHW: 0.82; MPPL: 0.57-0.63; AEPL: 0.61-0.62; MSLH: 1.33-1.4; AHS: 0.24; PLSH: 1.4-1.49. E: FP: 0.97-1; FSP: 0.6-0.63; RL: 0.15-0.19; OV: 0.24; EL: 0.24-0.27. FPHW: 1.33-1.34; FPSP: 1.54-1.65; FPCR: 5.26-6.6; OLSP: 0.38-0.4; FEOL: 1.06.

### *Nymph*

*Colour:* 1<sup>st</sup>-2<sup>nd</sup> instars cream and orange with black tergites, 5<sup>th</sup> instars pale grey-green.

*Structure:* Antennal segments seven.

*5th instar measurements and ratios:* (specimens 3) BL: 1.48-1.8; BW: 1.05-1.1; WL: 0.52-0.56; CPL: 0.5-0.53; CPW: 0.7-0.72; RW: 0.16-0.17; HW: 0.62-0.63; AL: 0.75-0.77; AL3: 0.17-0.19. WBL: 0.6-0.61; ALHW: 1.19-1.24; ALWL: 1.38-1.44; WLHW: 0.83-0.87; WCPL: 1.34-1.41; CPRW: 4.12-4.5.

*5th instar chaetotaxy:* Head setae simple (max length at anterior margin 0.14-0.16); ocular seta simple, typically dark and conspicuous (max length 0.07-0.08); primary post-ocular seta distinctly capitate (max length 0.1-0.11); secondary post-ocular seta simple or narrowly capitate (max length 0.09). Dorsal thoracic setae short simple and long capitate (max length 0.09-0.1). Prominent wing pad setae max length 0.11-0.12; forewing and hindwing pads with simple and capitate setae; forewing pad prominent setae 17-23, distinctly capitate, surface and marginal (10

marginal, 6-12 surface, 1 proximal); hindwing pad prominent setae 6-11, distinctly capitate, surface and marginal (2 apical, 3-8 surface, 1 proximal); proximal setae distinctly or narrowly capitate; numerous small simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on all tergites, short simple and long narrowly capitate (max length 0.1), prominent caudal plate setae present,  $\pm 25$ , distinctly capitate; sectasetae four pairs; marginal abdominal setae (other than sectasetae) four pairs, distinctly capitate (max length 0.15-0.17); pleurite setae paired capitate and simple. Legs with capitate setae present (max length 0.09-0.11); capitate foreleg setae present on tibia only, one (proximal, occasionally simple); capitate middle leg setae present on tibia only, two (1 proximal, 1 distal); capitate hind leg setae present on tibia only (femur seta typically simple or very slightly capitate), 3-4 (2 proximal, 2 distal).

*Host plant:* *Teline stenopetala* ssp. *spachiana*, *T. canariensis*.

*Distribution:* Canary Islands: Tenerife.

*Notes:* Occurs sympatrically with *A. pileolata*. It is much more abundant than *A. pileolata* on the host plant, *Teline stenopetala* ssp. *spachiana*, in pine forest habitat; while only a few adults were found on the host plant, *Teline canariensis*, in laurisilva habitat.

*Biology:* Small nymphs (1<sup>st</sup>-2<sup>nd</sup> instars) were observed in leaf buds and were found inside folded young leaves.

*Etymology:* Named for the discovery of this species in the ‘Menceyato de Güímar’, one of several seats of power for the Guanche people of Tenerife.

*Type material:* Holotype  $\Gamma$  (slide mounted), CANARY ISLANDS. TENERIFE: Güímar, Caldera de Pedro Gil, 28°20'30"N 16°28'W, 1775 m, ex *Teline stenopetala*, 26.iv.1998 (BMNH). Paratypes 2 $\Gamma$ , 2E, as for holotype (BMNH). 2 $\Gamma$ , 1E, as for holotype (DZUL). 2 $\Gamma$ , 2E, as for holotype (NHMB).

*Other material examined:* CANARY ISLANDS. TENERIFE: 1 $\Gamma$ , 3E, Anaga, E of Pico del Inglés, 28°32'15"N 16°16'30"W, c. 960 m, ex *Teline canariensis*, 25.iv.1998 (DP 179). 24 $\Gamma$ , 24E, 3 nymphs, as for holotype (DP 182).

***Arytinnis ochrita* sp. nov. (9)**

(Figs 11 & 27D)

*Adult*

*Colour:* Pale yellow to ochre; forewing clear, veins uniform light brown.

*Structure:* Surface forewing spinules present throughout all cells, or reduced in one or more cells; distribution of spinules non-uniform, medium density: 40-60 per 0.1mm<sup>2</sup>; apical spines in wing cells cu<sub>1</sub>, m<sub>1</sub> and m<sub>2</sub>, but absent, or occasionally few present in cell r<sub>2</sub>. Antennae short; genal cones short, terminal setae not darkly pigmented. Distal proboscis segment short.

Paramere short, in lateral view slender, with an apically thin neck above a reduced medially positioned ridge on the external side, and directed anteriorly, sclerotized apex dorsally rounded, with a slight anterior projection, in dorsal view contiguous more or less along entire inner margin, which is straight edged; proctiger not inflated towards the base; aedeagus distal segment with a shallow hook, tip of aedeagus hook acute, not turning upwards; male subgenital plate dorsal profile more or less straight and horizontal, or slightly raised anteriorly. Female proctiger dorsal profile more or less straight from anus to apex; subgenital plate ventral profile shallowly curved.

*Adult measurements and ratios:* (4Γ, 4E) total length: Γ 2.2-2.52, E 2.4-2.68; forewing: Γ length 1.7-1.98 width 0.68-0.79, E length 1.88-2.08 width 0.79-0.84; pterostigma length Γ 0.6-0.71, E 0.64-0.72; hindwing length Γ 1.45-1.63, E 1.53-1.73; head width: Γ 0.63-0.66, E 0.64-0.67; antennal length: 1.08-1.27; genal cone length: 0.08-0.11; distal proboscis segment length: 0.11-0.13. WLPT: 2.72-2.97; ALHW: 1.71-1.92; GCVL: 0.42-0.61; WLHW: 2.94-3.1; VLW: 0.44-0.53; WLW: 2.38-2.54; CUR: 1.65-2.09; MR: 0.44-0.53; RMCU: 4.91-5.72; TLFL: 1.17-1.24; TLHW: 0.68-0.76; SCHW: 0.78-0.87; ATIB: 0.27-0.3; MTIB: 0.24-0.28; PBHW: 0.17-0.2; ATMT: 1-1.17. *Adult genitalia* Γ: MP: 0.25-0.28; PL: 0.36-0.38; AEL: 0.24-0.26; AEH: 0.07-0.08. MPHW: 0.4-0.43; PLHW: 0.57-0.58; MPPL: 0.69-0.74; AEPL: 0.66-0.7; MSLH: 1.35-1.5; AHS: 0.29-0.31; PLSH: 1.46-1.57. E: FP: 0.67-0.72; FSP: 0.45-0.5; RL: 0.17-0.18; OV: 0.15-0.17; EL: 0.27-0.3. FPHW: 1.01-1.07; FPSP: 1.42-1.49; FPCR: 3.94-4.12; OLSP: 0.31-0.34; FEOL: 1.81.

*Nymph*

*Colour:* 3<sup>rd</sup> instars orange-yellow, 4<sup>th</sup>-5<sup>th</sup> instars yellow-green with black tergites.

*Structure:* Antennal segments seven.

*5th instar measurements and ratios:* (specimens 1) BL: 1.6-1.6; BW: 0.9-0.9; WL: 0.45-0.45; CPL: 0.39-0.39; CPW: 0.56-0.56; RW: 0.18-0.18; RL: 0.11-0.11; HW: 0.58-0.58; AL: 0.75-0.75; AL3: 0.19-0.19. WBL: 0.56; ALHW: 1.29; ALWL: 1.67; WLHW: 0.78; WCPL: 1.44; CPRW: 3.11.

*5th instar chaetotaxy:* Head setae simple and occasionally narrowly capitate (max length at anterior margin 0.09); ocular seta inconspicuous; primary post-ocular seta distinctly capitate (max length 0.07); secondary post-ocular seta, indistinct, small simple. Dorsal thoracic setae short simple (max length 0.02-0.03). Prominent wing pad setae max length 0.09; forewing pad with one prominent, distinctly capitate, apical seta; hindwing pad with simple and capitate setae, one prominent, distinctly capitate, apical seta, paired with small simple seta; proximal setae indistinct, minute simple setae scattered on wing pad surfaces. Dorsal abdominal prominent pre-caudal setae absent (small simple only), prominent caudal plate setae absent; sectasetae three pairs (small capitate seta in 1<sup>st</sup> position); marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate (max length 0.09); pleurite setae paired capitate and simple or small rod. Legs with capitate setae present (max length 0.08); capitate foreleg setae absent; capitate middle leg setae absent, or more probably, one distal; capitate hind leg setae present on tibia only, one (distal).

*Host plant:* *Teline osyroides* ssp. *osyroides*.

*Distribution:* Canary Islands: Tenerife.

*Notes:* Known from only one location where the host plant, *Teline osyroides* ssp. *osyroides*, survives in a population of circa 1000-2000 individuals around the Masca valley region of northwestern Tenerife. This is the smallest and possibly rarest species in *Arytinnis* gen. nov.

*Etymology:* Named for the small size and ochre colouration using the familiar diminutive form in Spanish.

*Type material:* Holotype ♂ (slide mounted), CANARY ISLANDS. TENERIFE: blw Masca, Barranco de Masca, 28° 18'N 16° 50'30"W, c. 600 m, 4.iv.1998 (BMNH). Paratypes 1♂, 2E, 1 nymph, as for holotype (BMNH). 1♂, 1E, as for holotype (DZUL). 1♂, 2E, as for holotype (NHMB).

*Other material examined:* CANARY ISLANDS. TENERIFE: 2E, blw Masca, Barranco de Masca, 28° 18'N 16° 50'30"W, 600 m, 2.vii.1997 (DP 33). 6♂, 3E, as for holotype (DP 153).

*Arytinnis occidentalis* sp. nov. (10)

(Figs 12, 28B &amp; 30E)

*Adult*

*Colour:* Bright green or yellow-green; forewing clear, veins uniform mid-brown.

*Structure:* Surface forewing spinules present in all cells, but reduced in one or more cells, or if absent only from cell c+sc, where there are typically few present; distribution of spinules uniform, density sparse: less than 40 per 0.1mm<sup>2</sup>; apical spines in wing cells cu<sub>1</sub>, m<sub>1</sub> and m<sub>2</sub>, but absent, or occasionally few present in cell r<sub>2</sub>. Antennae long; genal cones short, terminal setae not darkly pigmented. Distal proboscis segment mid-length. Paramere short, in lateral view slender and simple, with sides tapering towards the apex, a medial ridge is present on the inner surface, sclerotized apex dorsally rounded with small, anteriorly directed hook, in dorsal view contiguous anteriorly with inner margin concave; proctiger slightly inflated posteriorly towards the base; aedeagus distal segment with a well developed, curved hook, tip of aedeagus hook blunt; male subgenital plate dorsal profile slightly raised anteriorly. Female proctiger dorsal profile without a post anal depression, but slightly concave with an upturned apex; subgenital plate ventral profile shallowly curved; egg with stout lateral pedicel at the base.

*Adult measurements and ratios:* (6♂, 6♀) total length: ♂ 2.92-3.48, ♀ 3.08-3.88; forewing: ♂ length 2.4-2.72 width 0.96-1.1, ♀ length 2.55-3 width 1.03-1.23; pterostigma length ♂ 0.75-0.87, ♀ 0.78-0.96; hindwing length ♂ 1.94-2.2, ♀ 2.08-2.45; head width: ♂ 0.76-0.82, ♀ 0.8-0.89; antennal length: 1.7-2.1; genal cone length: 0.1-0.13; distal proboscis segment length: 0.14-0.19. WLPT: 2.83-3.33; ALHW: 2.12-2.51; GCVL: 0.46-0.57; WLHW: 3.1-3.37; VLW: 0.45-0.5; WLW: 2.38-2.58; CUR: 1.63-2.04; MR: 0.42-0.55; RMCU: 4.67-7.29; TLFL: 1.16-1.22; TLHW: 0.78-0.88; SCHW: 0.78-0.9; ATIB: 0.23-0.3; MTIB: 0.25-0.3; PBHW: 0.18-0.22; ATMT: 0.89-1.06. *Adult genitalia* ♂: MP: 0.24-0.27; PL: 0.35-0.4; AEL: 0.28-0.31; AEH: 0.08-0.10. MPHW: 0.31-0.36; PLHW: 0.46-0.49; MPPL: 0.68-0.77; AEPL: 0.75-0.84; MSLH: 1.17-1.29; AHS: 0.3-0.32; PLSH: 1.06-1.18. ♀: FP: 0.69-0.79; FSP: 0.47-0.56; RL: 0.21-0.24; OV: 0.15-0.17; EL: 0.23-0.28. FPHW: 0.86-0.91; FPSP: 1.41-1.53; FPCR: 3.13-3.41; OLSP: 0.3-0.34; FEOL: 1.56.

*Nymph*



*Colour:* 1<sup>st</sup>-3<sup>rd</sup> instars cream and orange-red, 4<sup>th</sup>-5<sup>th</sup> instars pale grey-green, blue-green or yellow-green, with or without black tergites.

*Structure:* Antennal segments eight.

*5th instar measurements and ratios:* (specimens 5) BL: 1.55-1.93; BW: 0.98-1.15; WL: 0.56-0.64; CPL: 0.47-0.51; CPW: 0.67-0.74; RW: 0.19-0.21; RL: 0.11-0.13; HW: 0.64-0.73; AL: 1.1-1.15; AL3: 0.27-0.29. WBL: 0.6-0.65; ALHW: 1.58-1.75; ALWL: 1.8-1.96; WLHW: 0.84-0.92; WCPL: 1.41-1.49; CPRW: 3.33-3.68.

*5th instar chaetotaxy:* Head setae simple (max length at anterior margin 0.13-0.17); ocular seta simple, typically dark and conspicuous (max length 0.08-0.09); primary and secondary post-ocular setae simple or narrowly capitate (max length 0.08-0.1). Dorsal thoracic setae long simple (max length 0.08-0.1). Prominent wing pad setae max length 0.11-0.14; forewing and hindwing pads with simple and capitate setae; forewing pad prominent setae two, marginal (1 apical, 1 proximal), apical seta distinctly capitate, proximal seta simple or narrowly capitate; hindwing pad with one prominent apical seta, distinctly capitate, paired with small simple seta, proximal seta short simple; small simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on anterior tergites, long simple (max length 0.12), prominent caudal plate setae typically absent or if present, two simple or narrowly capitate; sectasetae four pairs; marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate (max length 0.14-0.17); pleurite setae paired capitate and simple. Legs with simple setae only (max length 0.04).

*Host plant:* *Teline stenopetala* ssp. *sericea*, ssp. *stenopetala* and ssp. *microphylla*.

*Distribution:* Canary Islands: La Palma and El Hierro.

*Notes:* Occurs on the two most westerly islands, sympatrically with *A. modica* on the host plant, *Teline stenopetala*. In May, it is less common than *A. modica* on the two host subspecies restricted to the humid laurisilva habitat, ssp. *stenopetala* and ssp. *microphylla*; but during the same period it is abundant on ssp. *sericea* in dry pine forest habitat, from which *A. modica* was absent. In July, *A. occidentalis* was found to be more common than *A. modica* on both ssp. *stenopetala* and ssp. *microphylla*, suggesting (as with sympatric species on the host plant *Teline microphylla*) asynchronous development and habitat preference.

*Biology:* Eggs were found singly scattered on the clayx, in small clusters under floral bracts or at the base of developing fruit under the persistent calyx. Small nymphs (1<sup>st</sup>-3<sup>rd</sup> instars) were observed on the corolla and base of the developing fruit, however, nymphs were more typically

found on leaf buds and petioles. Larger nymphs (3<sup>rd</sup>-5<sup>th</sup> instars) and occasionally eggs were also found on the underside of mature leaves.

*Etymology*: Named for the geographic distribution of this species in the most westerly islands, La Palma and El Hierro.

*Type material*: Holotype  $\Gamma$  (slide mounted), CANARY ISLANDS. LA PALMA: rd to La Cumbrecita, 3-4 km from El Paso rd, 28°41'15"N 17°51'30"W, 1250 m, 16.v.1998 (BMNH). Paratypes 1 $\Gamma$ , 3E, 6 nymphs, as for holotype (BMNH). 2 $\Gamma$ , 1E, 5 nymphs, as for holotype (DZUL). 1 $\Gamma$ , 2E, 5 nymphs, as for holotype (NHMB). EL HIERRO: 2 $\Gamma$ , 2E, 5 nymphs, El Golfo, rd to Frontera, 27°44'N 18°01'30"W, 1100 m, 22.v.1998 (BMNH). 1E, as for previous (DZUL). 2 $\Gamma$ , 1E, as for previous (NHMB).

*Other material examined*: CANARY ISLANDS. LA PALMA: 6 $\Gamma$ , 4E, 2 nymphs, SE rd Santa Cruz to La Caldera, 28°43'N 17°46'W, 930 m, 15.vii.1997 (DP 73). 41 $\Gamma$ , 38E, 6 nymphs, as for holotype (DP 190). 2 $\Gamma$ , 3E, Los Tilos, Barranco del Agua, 28°47'30"N 17°47'45"W, c. 500 m, 17.v.1998 (DP 192). 2 $\Gamma$ , 3E, rd Barlovento to Garafía, c. 3 km E of Roque Faro, 28°48'15"N 17°52'30"W, c. 900 m, 19.v.1998 (DP 200). EL HIERRO: 8 $\Gamma$ , 5E, El Golfo, rd to Frontera, 27°43'30"N 18°1'30"W, 1070 m, 11.vii.1997 (DP 61). 3 $\Gamma$ , 1E, btw Mirador de la Peña and Mirador Jinama, 27°47'30"N 17°58'W, 960 m, 12.vii.1997 (DP 63.1). 2 $\Gamma$ , 2E, as for previous except, 900 m (DP 63.2). 59 $\Gamma$ , 50E, El Golfo, rd to Frontera, 27°44'N 18°01'30"W, 1100 m, 22.v.1998 (DP 212). 19 $\Gamma$ , 7E, nr Arbol Santo, 27°47'30"N 17°56'30"W, c. 1000 m, 23.v.1998 (DP 214).

*Arytinnis gomeræ* sp. nov. (11)

(Figs 13 &amp; 28A)

*Adult*

*Colour:* Bright green to mid-green; forewing clear, veins uniform light brown.

*Structure:* Surface forewing spinules present in all cells, but reduced in one or more cells; distribution of spinules uniform, sparse: less than 40 per 0.1mm<sup>2</sup>; apical spines in wing cells cu<sub>1</sub>, m<sub>1</sub> and m<sub>2</sub>, but absent, or occasionally few present in cell r<sub>2</sub>. Antennae short; genal cones short, terminal setae not darkly pigmented. Distal proboscis segment short. Paramere short, in lateral view S-shaped with sides tapering towards the apex, sclerotized apex dorsally flattened, with slight anterior projection, in dorsal view contiguous anteriorly with inner margin concave; proctiger slightly inflated posteriorly towards the base; aedeagus distal segment with a flattened, shallow hook, tip of aedeagus hook blunt; male subgenital plate dorsal profile slightly raised anteriorly. Female proctiger dorsal profile without a post anal depression, but slightly concave with an upturned apex; subgenital plate ventral profile shallowly curved.

*Adult measurements and ratios:* (4♂, 4♀) total length: ♂ 2.32-2.76, ♀ 2.64-2.92; forewing: ♂ length 1.91-2.03 width 0.82-0.85, ♀ length 2.18-2.29 width 0.92-0.96; pterostigma length ♂ 0.6-0.75, ♀ 0.67-0.8; hindwing length ♂ 1.59-1.65, ♀ 1.8-1.86; head width: ♂ 0.69-0.73, ♀ 0.72-0.75; antennal length: 1.38-1.5; genal cone length: 0.09-0.12; distal proboscis segment length: 0.13-0.14. WLPT: 2.82-3.25; ALHW: 1.84-2.05; GCVL: 0.43-0.57; WLHW: 2.77-3.18; VLW: 0.43-0.51; WLW: 2.25-2.45; CUR: 1.58-1.77; MR: 0.43-0.52; RMCU: 5.13-6.75; TLFL: 1.13-1.22; TLHW: 0.71-0.76; SCHW: 0.77-0.89; ATIB: 0.25-0.29; MTIB: 0.25-0.28; PBHW: 0.17-0.2; ATMT: 1-1.07. *Adult genitalia* ♂: MP: 0.25-0.28; PL: 0.3; AEL: 0.26-0.27; AEH: 0.07-0.08. MPHW: 0.36-0.38; PLHW: 0.41-0.43; MPPL: 0.83-0.87; AEPL: 0.87-0.9; MSLH: 1.17-1.3; AHS: 0.28-0.29; PLSH: 1-1.11. ♀: FP: 0.62-0.67; FSP: 0.4-0.44; RL: 0.18-0.22; OV: 0.14-0.15; EL: 0.23-0.27. FPHW: 0.86-0.89; FPSP: 1.48-1.55; FPCR: 2.95-3.1; OLSP: 0.3-0.35; FEOL: 1.75.

*Nymph*

*Colour:* 1<sup>st</sup>-2<sup>nd</sup> instars cream with red abdomens.

*Structure:* Antennal segments eight.

*5th instar measurements and ratios:* (specimens 4) BL: 1.4-1.75; BW: 0.88-1.03; WL: 0.48-0.51; CPL: 0.4-0.43; CPW: 0.6-0.64; RW: 0.17-0.19; RL: 0.1-0.11; HW: 0.59-0.64; AL: 0.82-0.88; AL3: 0.19-0.21. WBL: 0.53-0.66; ALHW: 1.28-1.49; ALWL: 1.63-1.8; WLHW: 0.75-0.83; WCPL:

1.43-1.55; CPRW: 3.26-3.76.

*5th instar chaetotaxy:* Head setae simple and occasionally narrowly capitate (max length at anterior margin 0.11-0.13); ocular seta simple, dark, conspicuous (max length 0.06-0.08); primary and secondary post-ocular setae distinctly capitate (max length 0.07-0.09). Dorsal thoracic setae short simple and long capitate (max length 0.05-0.09). Prominent wing pad setae max length 0.1-0.12; forewing and hindwing pads with simple and capitate setae; forewing pad prominent setae 2-6, distinctly capitate, marginal (1 apical, 1 proximal, 0-4 smaller marginal); hindwing pad prominent setae two, distinctly capitate, marginal (1 apical, 1 proximal), apical seta paired with small simple seta; proximal setae distinctly capitate; small simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on anterior tergites, long simple and capitate (max length 0.07), prominent caudal plate setae usually absent or if present, 1-4 distinctly capitate; sectasetae three or four pairs (1<sup>st</sup> may be reduced or simple-lanceolate); marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate (max length 0.12-0.14); pleurite setae paired capitate and simple. Legs with simple setae only, small rod seta sometimes present proximally on hind tibia (max length 0.02-0.03).

*Host plant:* *Teline stenopetala* ssp. *microphylla* and ssp. *pauciovulata*.

*Distribution:* Canary Islands: La Gomera.

*Notes:* Occurs sympatrically with *A. hupalupa* sp. nov. However, it is rare in collections made at higher altitudes in the laurisilva forest where *A. hupalupa* is abundant, and it is the only species found on the host in lower altitude habitats of dry sabinar or juniper scrub.

*Biology:* Eggs were found scattered on the surfaces of fruit and occasionally on leaf buds. 1<sup>st</sup>-2<sup>nd</sup> instar nymphs were found on fruit and 2<sup>nd</sup>-5<sup>th</sup> instars on leaf buds. Many nymphs were found on vegetative plants where they were attended by ants which were observed removing the excreted frass from the nymphs' abdomens.

*Etymology:* Named for the endemic status of this species on the island of La Gomera.

*Comment:* *A. gomerae* and *A. occidentalis* may represent an example of allopatric speciation as they occur on the same host plant but on different islands. Adult morphology and the unique

feature of eight antennal segments in the 5<sup>th</sup> instar nymph supports a close relationship between these taxa.

*Type material:* Holotype ♂ (slide mounted), CANARY ISLANDS. LA GOMERA: blw Roque Cano, 28° 11'N 17° 15'30"W, 300-400 m, 26.v.1998 (BMNH). Paratypes 2♂, 2♀, 5 nymphs, as for holotype (BMNH). 1♂, 2♀, 5 nymphs, as for holotype (DZUL). 2♂, 2♀, 5 nymphs, as for holotype (NHMB).

*Other material examined:* CANARY ISLANDS. LA GOMERA: 3♂, 2♀, nr El Cedro, 28° 7'30"N 17° 14'W, 950 m, 14.vii.1997 (DP 71). 1♀, rd Hermigua to Monte del Cedro, 28° 07'16"N 17° 12'30"W, 700-1000 m, 25.v.1998 (DP 219). 21♂, 16♀, 26 nymphs, as for holotype (DP 221). 36♂, 32♀, Ermita de las Nieves, 28° 06'30"N 17° 11'W, c. 1000 m, 30.vii.2000 (DP 344). 25♂, 41♀, 10 nymphs, Roque Agando, 28° 06'N 17° 12'W, c. 1000 m, 31.vii.2000 (DP 345).

***Arytinnis hupalupa* sp. nov. (12)**

(Figs 14, 15C–D & 27A)

*Adult*

*Colour:* Grey-green or mid-green to yellow-green; forewing clear, veins uniform mid-brown.

*Structure:* Surface forewing spinules present in all cells, but reduced in one or more cells; distribution of spinules uniform, sparse: less than 40 per 0.1mm<sup>2</sup>; apical spines in wing cells cu<sub>1</sub>, m<sub>1</sub> and m<sub>2</sub>, but absent, or occasionally few present in cell r<sub>2</sub>. Antennae short; genal cones very short, terminal setae not darkly pigmented. Distal proboscis segment short. Paramere long, in lateral view slender, more or less parallel sided, with an apically thin neck above a ridge produced on the external side and directed anteriorly, sclerotized apex small, not hooked, but with a small anterior projection and displaced to the posterior of the top of the paramere, in dorsal view contiguous anteriorly, inner margin straight edged; proctiger not, or only slightly inflated posteriorly towards the base; aedeagus distal segment with a well developed, curved hook, tip of aedeagus hook blunt and turning upwards; male subgenital plate dorsal profile raised anteriorly. Female proctiger dorsal profile more or less straight from anus to apex, or with slight post anal depression; subgenital plate ventral profile shallowly curved.

*Adult measurements and ratios:* (3 $\Gamma$ , 3E) total length:  $\Gamma$  2.6-2.84, E 2.76-3.16; forewing:  $\Gamma$  length 2.1-2.21 width 0.86-0.87, E length 2.35-2.38 width 0.91-0.97; pterostigma length  $\Gamma$  0.75-0.8, E 0.73-0.8; hindwing length  $\Gamma$  1.73-1.8, E 1.93-1.95; head width:  $\Gamma$  0.66-0.72, E 0.72-0.74; antennal length: 1.31-1.47; genal cone length: 0.05-0.1; distal proboscis segment length: 0.12-0.14. WLPT: 2.75-3.26; ALHW: 1.77-2.16; GCVL: 0.31-0.5; WLHW: 2.92-3.33; VLW: 0.41-0.48; WLW: 2.41-2.59; CUR: 1.61-1.93; MR: 0.45-0.49; RMCU: 5.32-6.5; TLFL: 1.13-1.2; TLHW: 0.71-0.81; SCHW: 0.82-0.89; ATIB: 0.25-0.3; MTIB: 0.25-0.29; PBHW: 0.18-0.19; ATMT: 0.94-1.14. *Adult genitalia*  $\Gamma$ : MP: 0.32-0.35; PL: 0.56; AEL: 0.32-0.33; AEH: 0.08-0.09. MPHW: 0.44-0.53; PLHW: 0.78-0.85; MPPL: 0.57-0.63; AEPL: 0.57-0.59; MSLH: 1.31-1.47; AHS: 0.27-0.28; PLSH: 1.6-1.75. E: FP: 0.89-0.93; FSP: 0.56; RL: 0.17-0.2; OV: 0.2-0.21; EL: 0.18-0.26. FPHW: 1.24-1.26; FPSP: 1.59-1.66; FPCR: 4.65-5.24; OLSP: 0.36; FEOL: 1.08.

### *Nymph*

*Colour:* 1<sup>st</sup>-2<sup>nd</sup> instars cream and orange, some with black tergites, 3<sup>rd</sup>-5<sup>th</sup> instars pale yellow or green with black tergites.

*Structure:* Antennal segments seven.

*5th instar measurements and ratios:* (specimens 5) BL: 1.45-1.9; BW: 0.93-1.13; WL: 0.54-0.61; CPL: 0.46-0.5; CPW: 0.62-0.66; RW: 0.16-0.17; RL: 0.1-0.1; HW: 0.59-0.62; AL: 0.75-0.82; AL3: 0.16-0.18. WBL: 0.59-0.64; ALHW: 1.15-1.33; ALWL: 1.3-1.41; WLHW: 0.86-1; WCPL: 1.3-1.43; CPRW: 3.65-4.

*5th instar chaetotaxy:* Head setae simple (max length at anterior margin 0.1-0.14); ocular seta simple, inconspicuous (max length 0.02-0.04); primary post-ocular seta narrowly or distinctly capitate (max length 0.07); secondary post-ocular seta simple (max length 0.03-0.05). Dorsal thoracic setae short simple (max length 0.02-0.04). Prominent wing pad setae max length 0.07-0.08; forewing pad with simple and capitate or simple setae only, with one prominent apical seta simple or narrowly capitate; hindwing pad with simple and capitate setae, with one prominent apical seta distinctly or narrowly capitate, paired with small simple seta; proximal setae indistinct from small simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae absent or if present on anterior tergites, short simple (max length 0.03-0.04), prominent caudal plate setae absent (numerous small simple); sectasetae four pairs; marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate (4<sup>th</sup> small

simple, or occasionally small capitate) (max length 0.09-0.11); pleurite setae typically paired simple, or longer simple with short, slightly capitate setae. Legs with capitate setae present (max length 0.04-0.08); capitate foreleg setae absent; capitate middle leg setae absent or if present on the tibia only, one (distal, or occasionally one small capitate seta present proximally); capitate hind leg setae present (but often narrow) on femur and tibia, or tibia only (small seta on femur capitate or simple), on the tibia 1-2 (1 larger distally, and typically 1 smaller proximally).

*Host plant:* *Teline stenopetala* ssp. *microphylla* and ssp. *pauciovulata*.

*Distribution:* Canary Islands: La Gomera.

*Notes:* It is occasionally sympatric with *A. gomerae* but is much more abundant in the humid laurisilva habitat than this species.

*Biology:* Small nymphs (1<sup>st</sup>-2<sup>nd</sup> instars) were observed on leaf buds and developing fruit.

*Comment:* The shape of the male paramere is intermediate between *A. dividens* and *A. modica* (see Fig. 15). Otherwise *A. hupalupa* is very similar but considerably smaller than these species.

*Etymology:* The name is that of the pre-hispanic king of La Gomera.

*Type material:* Holotype ♂ (slide mounted), CANARY ISLANDS. LA GOMERA: rd Hermigua to Monte del Cedro, 28°07'16"N 17°12'30"W, 700-1000 m, 25.v.1998 (BMNH). Paratypes 3♂, 3♀, 8 nymphs, as for holotype (BMNH). 2♂, 3♀, 4 nymphs, as for holotype (DZUL). 3♂, 2♀, 5 nymphs, as for holotype (NHMB).

*Other material examined:* CANARY ISLANDS. LA GOMERA: 2♂, 4♀, nr El Cedro, 28°7'30"N 17°14'W, 950 m, 14.vii.1997 (DP 71). 72♂, 67♀, 30 nymphs, as for holotype (DP 219). 1♀, Ermita de las Nieves, 28°06'30"N 17°11'W, c. 1000 m, 30.vii.2000 (DP 344). 1♀, Roque Agando, 28°06'N 17°12'W, c. 1000 m, 31.vii.2000 (DP 345).

*Arytinnis modica* (Loginova) **comb. nov.**

(Figs 15A–B &amp; 27B)

*Arytainilla modica* Loginova, 1976: 23

*Adult Colour:* Mid-green to yellow-green or grey-green; forewing clear, veins uniform light or mid-brown.

*Adult Description:* Loginova (1976).

*Nymph*

*Colour:* 1<sup>st</sup>-2<sup>nd</sup> instars orange or cream, some with black tergites, 4<sup>th</sup>-5<sup>th</sup> instars pale green or yellow.

*Structure:* Antennal segments seven.

*5th instar measurements and ratios:* (specimens 4) BL: 1.6-1.75; BW: 1-1.03; WL: 0.57-0.65; CPL: 0.47-0.55; CPW: 0.61-0.7; RW: 0.17-0.18; RL: 0.1-0.1; HW: 0.61-0.69; AL: 0.88-1.08; AL3: 0.2-0.26. WBL: 0.57-0.63; ALHW: 1.44-1.59; ALWL: 1.52-1.72; WLHW: 0.84-0.97; WCPL:

1.27-1.47; CPRW: 3.59-4.12.

*5th instar chaetotaxy:* Head setae simple (max length at anterior margin 0.12-0.17); ocular seta simple, inconspicuous (max length 0.03-0.05); primary post-ocular seta simple or narrowly capitate (max length 0.09); secondary post-ocular seta simple (max length 0.07). Dorsal thoracic setae short simple (max length 0.03-0.06). Prominent wing pad setae max length 0.07-0.09; forewing and hindwing pads with simple and capitate setae, each pad with one prominent apical seta, distinctly or narrowly capitate; hindwing pad apical seta paired with smaller simple seta; proximal setae if present simple, sometimes indistinct from small simple surface setae. Dorsal abdominal prominent pre-caudal setae absent, or present on anterior tergites, short simple (max length 0.04-0.05), prominent caudal plate setae absent (numerous small simple); sectasetae four pairs; marginal abdominal setae (other than sectasetae) three or four pairs (4<sup>th</sup> sometimes reduced or simple), distinctly capitate (max length 0.1-0.14); pleurite setae paired capitate and simple. Legs with capitate setae present (max length 0.06-0.1); capitate foreleg setae absent; capitate middle leg setae present on tibia only, two (1 proximal, 1 larger distal); capitate hind leg setae present on femur and tibia, on the tibia 2-3 (1-2 proximal, 1 larger distal).



*Host plant:* *Teline stenopetala* ssp. *stenopetala* and ssp. *microphylla*, *Chamaecytisus proliferus*.

*Distribution:* Canary Islands: La Palma and El Hierro.

*Notes:* This is the only species with bi-generic host preference in *Arytinnis* gen. nov. It occurs on the two most westerly islands where it replaces the closely related *A. dividens* on the host plant *Chamaecytisus proliferus*. It occurs sympatrically with *A. occidentalis* on *Teline stenopetala* ssp. *stenopetala* and ssp. *microphylla*, and sympatrically with *Arytaina devia* on *Chamaecytisus proliferus*.

*Biology:* Clusters of eggs and small nymphs (1<sup>st</sup>-2<sup>nd</sup> instars) were found under floral bracts and petiolar bracts. Small nymphs were also observed on leaf buds and on fruit.

*Comment:* The colonization of host plants in two unrelated genera (i.e. from different host groups within the Genisteae) appears to originate from a recent host switch in the progenitor of *A. modica* (possibly *A. hupalupa* on La Gomera) from *Chamaecytisus* to *Teline*, and the subsequent retention of preference to both hosts with the colonization of El Hierro or La Palma. This evolutionary scenario and the genetic variation in these host races is currently being investigated in a molecular analysis.

*Material examined:* CANARY ISLANDS. LA PALMA: 3Γ, 2E, 1 nymph, SE rd Santa Cruz to La Caldera, 28°43'N 17°46'W, 930 m, ex *Teline stenopetala*, 15.vii.1997 (DP 73). 1E, SE rd Santa Cruz to La Caldera, abv Fuente de Olén, 28°44'N 17°49'W, 1850 m, ex *Chamaecytisus proliferus*, 16.vii.1997 (DP 79). 1Γ, 2E, 1 nymph, E of tunnel under Cumbre Nueva, 28°39'N 17°49'W, 1020 m, ex *Teline stenopetala*, 17.vii.1997 (DP 82). 5Γ, 1E, rd to La Cumbrecita, c. 3-5 km N of El Paso rd, 28°39'30"N 17°50'45"W, c. 900 m, ex *Chamaecytisus proliferus*, 16.v.1998 (DP 189). 13Γ, 16E, 4 nymphs, Los Tilos, Barranco del Agua, 28°47'30"N 17°47'45"W, c. 500 m, ex *Teline stenopetala*, 17.v.1998 (DP 192). 30Γ, 30E, 12 nymphs, rd Barlovento to Garafia, c. 3 km E of Roque Faro, 28°48'15"N 17°52'30"W, c. 900 m, ex *Teline stenopetala*, 19.v.1998 (DP 200). 49Γ, 26E, 9 nymphs, NW rd from Llano Negro to La Caldera, 28°48'N 17°55'30"W, c. 1050 m, ex *Chamaecytisus proliferus*, 19.v.1998 (DP 201). 1E, 6 nymphs, SE rd Santa Cruz to La Caldera, 28°43'30"N 17°48'30"W, c. 1700 m, ex *Chamaecytisus proliferus*, 20.v.1998 (DP 205). EL HIERRO: 1Γ, rd Ermita de los Reyes to El Pinar, 27°43'30"N 18°1'30"W, 960 m, ex *Chamaecytisus proliferus*, 10.vii.1997 (DP 59). 3E, El Golfo, rd to Frontera, 27°43'30"N 18°1'30"W, 1070 m, ex *Teline stenopetala*, 11.vii.1997 (DP 61). 1E, btw Mirador de la Peña and Mirador Jinama, 27°47'30"N 17°58'W, 960 m, ex *Teline*

*stenopetala*, 12.vii.1997 (DP 63.1). 4Γ, 1E, as for previous except, 900 m (DP 63.2). 6 nymphs, as for previous except, 27°48'N 17°58'W, 860 m, ex *Chamaecytisus proliferus* (DP 64). 89Γ, 56E, 3 km W of San Andres, 27°45'30"N 17°58'30"W, 1250 m, ex *Chamaecytisus proliferus*, 22.v.1998 (DP 210). 6Γ, 9E, 1 nymph, El Golfo rim, nr Mirador del Golfo, 27°45'30"N 17°59'W, c. 1300 m, ex *Chamaecytisus proliferus*, 22.v.1998 (DP 211). 33Γ, 28E, 11 nymphs, El Golfo, rd to Frontera, 27°44'N 18°01'30"W, 1100 m, ex *Teline stenopetala*, 22.v.1998 (DP 212). 9Γ, 9E, nr Arbol Santo, 27°47'30"N 17°56'30"W, c. 1000 m, ex *Teline stenopetala*, 23.v.1998 (DP 214). 3Γ, 1E, El Golfo, blw Mirador de Jinama, 27°45'15"N 17°59'W, 1100 m, ex *Chamaecytisus proliferus*, 23.v.1998 (DP 215). 22Γ, 27E, rd N of Mirador de Jinama, 27°48'15"N 17°58'30"W, c. 900 m, ex *Chamaecytisus proliferus*, 23.v.1998 (DP 216).

*Arytinnis dividens* (Loginova) **comb. nov.**

(Figs 15E–F & 27C)

*Arytainilla dividens* Loginova, 1976: 21

*Adult Colour*: Grey-green or mid-green to yellow-green, sometimes with parameres noticeable blue, mature specimens may be darker; forewing clear, veins uniform mid-brown.

*Adult Description*: Loginova (1976).

*Nymph*

*Colour*: 1<sup>st</sup>-3<sup>rd</sup> instars cream or orange, with black tergites, 4<sup>th</sup>-5<sup>th</sup> instars pale green or blue-grey, with or without black tergites.

*Structure*: Antennal segments seven.

*5th instar measurements and ratios*: (specimens 9) BL: 1.73-2.25; BW: 1.08-1.33; WL: 0.53-0.65; CPL: 0.49-0.59; CPW: 0.7-0.85; RW: 0.17-0.2; RL: 0.1-0.11; HW: 0.7-0.94; AL: 1-1.24; AL3: 0.23-0.31. WBL: 0.57-0.62; ALHW: 1.29-1.66; ALWL: 1.69-2.07; WLHW: 0.74-0.91; WCPL: 1.32-1.52; CPRW: 3.5-5.

*5th instar chaetotaxy*: Head setae simple (max length at anterior margin 0.15-0.17); ocular seta simple, more or less inconspicuous (max length 0.04-0.07); primary and secondary post-ocular setae simple, narrowly or distinctly capitate (max length 0.09-0.12). Dorsal thoracic setae short and long simple, occasionally narrowly capitate (max length 0.06-0.08). Prominent wing pad setae max length 0.1-0.12; forewing and hindwing pads with simple and capitate setae;

forewing pad prominent setae two, marginal (1 apical, 1 proximal, with numerous shorter simple setae on the outer margin) apical seta narrowly or distinctly capitate; hindwing pad prominent setae two, marginal (1 apical, 1 proximal) apical seta distinctly capitate, paired with small simple seta; proximal setae simple, narrowly or distinctly capitate; small simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on anterior tergites, occasionally few on posterior tergites, long simple and capitate (max length 0.11), prominent caudal plate setae present, two or four, distinctly capitate; sectasetae three or four pairs (1<sup>st</sup> pair may be reduced or simple); marginal abdominal setae (other than sectasetae) three or four pairs (4<sup>th</sup> frequently reduced or simple), distinctly capitate (max length 0.13-0.16); pleurite setae paired capitate and simple. Legs with capitate setae present (max length 0.09-0.12); capitate foreleg setae absent (occasionally one proximally on the tibia); capitate middle leg setae present on femur and tibia, or tibia only, on the tibia 2-4 (2 larger and 2 small); capitate hind leg setae present on femur and tibia or tibia only, on the tibia 5-7.

*Host plant:* *Chamaecytisus proliferus*, on all three recognized subspecies (Acebes Ginovés, Arco Aguilar & Wildpret de la Torre, 1991).

*Distribution:* Canary Islands: Gran Canaria, Tenerife, and La Gomera.

*Notes:* Occurs sympatrically, on the two central islands and western island of La Gomera, with *Arytaina devia*. However, it is generally more common earlier in the year, and in more humid habitats, than the latter species. The host plant is a widespread and variable species, three subspecies and four varieties are recognized (Acebes Ginovés et al., 1991), but there is no apparent preference or specificity to intraspecific host taxa.

*Biology:* Eggs were observed in small clusters of three to five on the inner surface, typically along the midrib, of folded new leaves, and often towards the tips of the more mature leaves in developing leaf buds. In the latter instance, 1<sup>st</sup> instar nymphs on hatching migrate down into the bud to feed on the younger leaves (Fig. 31B). Eggs were also found singly, scattered on the surface of fruit. Small nymphs (1<sup>st</sup>-2<sup>nd</sup> instars) were observed on leaf buds, and (1<sup>st</sup>-5<sup>th</sup> instars) were observed at the base of fruit, beneath the persistent calyx.

*Comment:* One  $\Gamma$  was recorded from La Palma by Loginova (1976) but this distribution has not been corroborated during this study.

*Material examined:* (ex *Chamaecytisus proliferus* unless otherwise stated) CANARY ISLANDS. GRAN CANARIA: 1E, NE of Tejada, rd to Cruz de Tejada, 28°0'N 15°36'30"W,

1300 m, 5.vii.1997 (DP 38). 16Γ, 13E, c. 2-3 km S of Moya on rd to San Bartolomé de Fontanales, 28°5'45"N 15°35'15"W, 680 m, 15.iv.1998 (DP 157). 2Γ, 5E, c. 5 km S of Moya on rd to San Bartolomé de Fontanales, 28°5'N 15°35'30"W, c. 800 m, ex *Teline stenopetala*, 15.iv.1998 (DP 158). 14Γ, 15E, 42 nymphs, rd San Bartolomé de Tirajana to Fataga, 27°54'30"N 15°34'30"W, 920 m, 16.iv.1998 (DP 161). 7Γ, 10E, base of Risco Blanco, 27°56'N 15°33'30"W, 1150 m, ex *Teline rosmarinifolia*, 18.iv.1998 (DP 165). 10Γ, 7E, 17 nymphs, Barranco de Mogán, abv town of Mogán, 27°54'30"N 15°42'30"W, c. 500 m, 18.iv.1998 (DP 167). 61Γ, 6E, 28 nymphs, valley NE of Tejeda, btw Cruz de Tejeda and Tejeda, 27°59'30"N 15°35'W, 1300 m, 19.iv.1998 (DP 168). 29Γ, 12E, 2 nymphs, rd btw Moya and St Bartolome de Fontanales, 28°5'45"N 15°35'15"W, c. 700 m, 19.iv.1998 (DP 169). 4Γ, 2E, Gran Canaria, 1 km N of Cruz de Tejeda, 28°30'N 15°35'30"W, c. 1500 m, ex *Teline microphylla*, 20.iv.1998 (DP 172). 27Γ, 22E, 3 nymphs, just N of Cruz de Tejeda, rd Cruz de Tejeda to Valleseco, 28°30'N 15°35'30"W, c. 1500 m, 20.iv.1998 (DP 174). 47Γ, 31E, 21 nymphs, rd Cruz de Tejeda to San Mateo 28°00'N 15°34'30"W, c. 1220 m, 20.iv.1998 (DP 176). TENERIFE: 5Γ, 2E, 3 nymphs, rd to Parque Nacional del Teide, Miradores de la Cumbre, 28°23'30"N 16°26'W, 1800 m, 22.vi.1997 (DP 6). 3Γ, 2E, 3 nymphs, rd Buenavista to Santiago del Teide, N of turning to Los Carrizales, 28°19'N 16°50'30"W, 900 m, 28.vi.1997 (DP 19). 41Γ, 37E, 81 nymphs, as for previous (DP 20). 1Γ, 2 nymphs, just N of Aguamansa, 28°21'30"N 16°30'W, 950 m, 29.vi.1997 (DP 23.2). 8Γ, 11E, mirador NW of Santiago del Teide, Barranco Seco, 28°18'30"N 16°49'30"W, 1000 m, 2.vii.1997 (DP 32). 3Γ, 11E, 29 nymphs, rd El Teide to Arafo 28°23'N 16°25'W, 1250 m, 9.vii.1997 (DP 53). 1Γ, Teno, 7 km S of Buenavista on rd to Santiago del Teide, 28°20'N 16°51'W, c. 800 m, ex *Teline canariensis*, 4.iv.1998 (DP 152). 4Γ, 5E, 6 nymphs, blw Mirador de la Cumbre Norte, 28°22'30"N 16°27'30"W, c. 1850 m, 10.iv.1998 (DP 155). 6Γ, 13E, Barranco del Rey, NW of Arona, 28°06'30"N 16°41'30"W, c. 700 m, 10.v.1998 (DP 185). 5Γ, 5E, as for previous except, ex *Teline osyroides* (DP 186). 10Γ, 9E, 5 nymphs, N of Vilaflor, 28°10'30"N 16°39'W, c. 1900 m, 10.v.1998 (DP 188). LA GOMERA: 65Γ, 53E, 43 nymphs, rd Arure to Las Hayas, 28°7'30"N 17°18'30"W, 900 m, 13.vii.1997 (DP 68). 3Γ, 2E, as for previous except, ex *Spartocytisus filipes* (DP 69). 4Γ, 4E, as for previous except, ex *Retama monosperma* (DP 70). 36Γ, 23E, 24 nymphs, La Laguna Grande, Garajonay Park, 28°06'30"N 17°16'W, c. 1300 m, 26.v.1998 (DP 224). 22Γ, 30E, blw Roque de Agando, 28°06'N

17° 12'30"W, 900-1000 m, 27.v.1998 (DP 227). 8Γ, 6E, as for previous except, ex *Teline stenopetala* (DP 228).

*Arytinnis umbonata* (Loginova) **comb. nov.**

(Fig. 25A)

*Arytainilla umbonata* Loginova, 1976: 30

*Adult Colour:* Grey-green to yellow-green with pale yellow or orange thorax; forewing cells with small brown patches apically, veins uniform mid- or dark brown.

*Adult Description:* Loginova (1976).

*Nymph*

*Colour:* 1<sup>st</sup>-3<sup>rd</sup> instars cream and orange, 4<sup>th</sup>-5<sup>th</sup> instars green or yellow with pink abdomens, with or without black tergites.

*Structure:* Antennal segments seven.

*5<sup>th</sup> instar measurements and ratios:* (specimens 6) BL: 1.45-1.75; BW: 0.95-1.1; WL: 0.56-0.6; CPL: 0.48-0.51; CPW: 0.65-0.7; RW: 0.16-0.19; RL: 0.11-0.12; HW: 0.61-0.68; AL: 0.95-1.07; AL3: 0.23-0.26. WBL: 0.62-0.66; ALHW: 1.42-1.72; ALWL: 1.58-1.88; WLHW: 0.84-0.94; WCPL: 1.3-1.46; CPRW: 3.53-4.06.

*5th instar chaetotaxy:* Head setae simple (max length at anterior margin 0.12-0.14); ocular seta simple, inconspicuous, occasionally longer and darker (max length 0.04-0.05); primary post-ocular seta distinctly capitate (max length 0.08-0.1); secondary post-ocular seta narrowly or distinctly capitate (max length 0.05-0.09). Dorsal thoracic setae short simple and long capitate (max length 0.05-0.09). Prominent wing pad setae max length 0.1-0.14; forewing and hindwing pads with simple and capitate setae; forewing pad prominent setae 8-10, distinctly capitate, marginal (7-9 outer margin, 1 proximal); hindwing pad prominent setae distinctly capitate, 1-2 marginal (1 apical, 1 proximal), apical seta paired with small simple seta; proximal setae simple, narrowly or distinctly capitate; small simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on anterior tergites, long simple and capitate (max length 0.07-0.11), prominent caudal plate setae absent; sectasetae three pairs (occasionally reduced 4<sup>th</sup> pair present); marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate (max length 0.13-0.16); pleurite setae paired capitate and simple. Legs with simple setae only (max length 0.04-0.05).

*Host plant: Genista tenera.*

*Distribution: Madeira.*

*Notes:* Occurs throughout the host plant range from dry lowland to laurisilva habitat.

*Biology:* Eggs were found scattered on petioles and on the rim of floral bracts. Nymphs (1<sup>st</sup>-5<sup>th</sup> instars) observed on the calyx and corolla, and inside the flower on the staminal column.

*Comment:* Although the form of the adult genitalia is distinct, the 5<sup>th</sup> instar nymph is extremely similar to *A. incuba*, the only other Madeiran species, and to *A. hakani* from the Mediterranean.

*Material examined:* MADEIRA: 20♂, 20♀, 13 nymphs, Ribeiro Frio, Levada do Furado, W of Balcões, 900 m, 30.vi.1998 (DP 268). 12♂, 15♀, 7 nymphs, just N of Ribeira Brava, rd to Serra de Água, c. 100 m, 1.vii.1998 (DP 270). 15♂, 17♀, 3 nymphs, Pico do Gato, c. 1500 m, 2.vii.1998 (DP 272). 26♂, 23♀, 17 nymphs, Encumeada, path to Pico Ruivo, c. 1050 m, 3.vii.1998 (DP 273.1).

*Arytinnis incuba* (Loginova) **comb. nov.**

(Fig. 25C)

*Arytainilla incuba* Loginova, 1976: 28

*Adult Colour:* mid-green to yellow-green, paler orange on the thorax, with some mature specimens darker; forewing clear, veins uniform mid- or dark brown.

*Adult Description:* Loginova (1976).

*Nymph*

*Colour:* 1<sup>st</sup>-3<sup>rd</sup> instars cream and orange, 4<sup>th</sup>-5<sup>th</sup> instars yellow-green or blue-green, with or without black tergites.

*Structure:* Antennal segments seven.

*5th instar measurements and ratios:* (specimens 5) BL: 1.6-1.95; BW: 1.03-1.15; WL: 0.6-0.61; CPL: 0.51-0.53; CPW: 0.68-0.8; RW: 0.19-0.21; RL: 0.11-0.13; HW: 0.68-0.73; AL: 1.18-1.22; AL3: 0.26-0.29. WBL: 0.57-0.64; ALHW: 1.64-1.75; ALWL: 1.97-2; WLHW: 0.83-0.88; WCPL: 1.31-1.51; CPRW: 3.24-3.89.

*5th instar chaetotaxy*: Head setae simple and narrowly capitate (mostly simple anteriorly and capitate posteriorly) (max length at anterior margin 0.14-0.17); ocular seta simple, dark, conspicuous (max length 0.07-0.09); primary and secondary post-ocular setae distinctly capitate (max length 0.11-0.14). Dorsal thoracic setae long capitate with short or minute simple (max length 0.13-0.14). Prominent wing pad setae max length 0.12-0.14; forewing and hindwing pads with simple and capitate setae; forewing pad prominent setae 8-10, distinctly capitate, marginal (7-9 outer margin, 1 proximal); hindwing pad prominent setae two, distinctly capitate, marginal (1 apical, 1 proximal), apical seta paired with small simple seta; proximal setae distinctly capitate (or rarely simple); small simple or occasionally small capitate or rod setae on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on anterior tergites, long capitate (max length 0.11-0.15), prominent caudal plate setae typically absent or if present, two, distinctly capitate; sectasetae three pairs; marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate (max length 0.14-0.17); pleurite setae paired capitate and simple. Legs with simple setae only (max length 0.04-0.07).

*Host plant*: *Teline maderensis*.

*Distribution*: Madeira.

*Notes*: Occurs throughout the host plant range and on both subspecies recognized (Arco Aguilar 1983).

*Biology*: Eggs were found singly along the sericeous edges and midribs of mature leaves, or on petioles and stems. Clusters of eggs were also found under petiolar bracts and leaf bud bracts. Small nymphs (1<sup>st</sup>-2<sup>nd</sup> instars) were also observed in these locations, and on the fruit. Many nymphs were collected from vegetative plants.

*Comment*: This species is extremely similar to the Mediterranean species *A. hakani*, and a record from Sicily (Conci et al. 1993) may be a misidentification of the latter species.

*Material examined*: MADEIRA: 25♂, 20♀, 20 nymphs, Ribeiro Frio, Levada do Furado, W of Balcões, 900 m, 30.vi.1998 (DP 267). 31♂, 15♀, 6 nymphs, Porto do Moniz, Levada da Central da Ribeira da Janela, 400 m, 1.vii.1998 (DP 271). 17♂, 11♀, 16 nymphs, W of Encumeada, rd to Porto do Moniz, 1100 m, 3.vii.1998 (DP 274). 16♂, 9♀, 6 nymphs, Encumeada, Levada do Norte, 1000 m, 3.vii.1998 (DP 276).

*Arytinnis hakani* (Loginova) **comb. nov.**

*Arytainilla hakani* Loginova, 1972: 21

*Adult Colour:* Bright green to mid-green or yellow-green; forewing clear, veins uniform light brown.

*Adult and Nymphal Descriptions:* Loginova (adult, 1972), Rapisarda (5<sup>th</sup> instar nymph, 1987).

*Nymphal Colour:* 4<sup>th</sup>-5<sup>th</sup> instars bright green or paler blue-green.

*Host plant:* *Teline monspessulana*.

*Distribution:* Continental: Mediterranean.

*Notes:* This species has the most widespread distribution of the three continental members of *Arytinnis* gen. nov. It is recorded from the western Mediterranean as far east as Algeria (Burckhardt, 1989a) and southern Italy (Conci et al., 1993); the host plant distribution, however, extends further east to Syria (Gibbs & Dingwall, 1972).

*Comment:* Both adult and 5<sup>th</sup> instar nymph are extremely similar to the Madeiran species, *A. incuba*, and these two species may represent disjunct host races which have undergone recent diversification.

*Material examined:* MOROCCO: 28♂, 16♀, 3 nymphs, Western Rif Mountains, rd Bab-Taza to Chefchaouen, W of Bab-Taza, 35°10'N 5°20'W, c. 1000 m, 29.iii.1998 (DP 146). 24♂, 23♀, Western Rif Mountains, btw Ketama and Chefchaouen, E of Bab Berret, 34°56'N 4°50'W, c. 1400 m, 22.vi.1998 (DP 256). 1♂, 7♀, as for previous except, ex *Adenocarpus decorticans* (DP 254). 4♂, 4♀, as for previous except, ex *Cytisus villosus* (DP 255). SPAIN: 12♂, 15♀, 8 nymphs, Andalusia, Parque Natural de los Alcornocales, W of Los Barrios to Alcalá de los Gazules rd, 36°15'N 5°37'W, c. 300 m, 25.xii.1997 (DP 118). 38♂, 23♀, 21 nymphs, Andalusia, c. 10 km S of Ubrique, rd to Puerto de Galis, 36°35'N 5°30'W, c. 600-700 m, 24.iii.1998 (DP 143). 2♂, as for previous except, c. 15 km S of Ubrique, 36°33'N 5°30'W, ex *Teline linifolia* (DP 144).

*Arytinnis cognata* (Loginova) **comb. nov.**

(Fig. 25B)

*Arytainilla cognata* Loginova, 1972: 22



*Adult Colour:* Grey-green to yellow-green, mature specimens darker with abdominal intersegments yellow-green; forewing clear, veins uniform mid-brown.

*Adult Descriptions:* Loginova (1972, 1977).

### *Nymph*

*Colour:* 5<sup>th</sup> instars bright green to blue-green or yellow-orange, with black tergites.

*Structure:* Antennal segments seven.

*5th instar measurements and ratios:* (specimens 7) BL: 1.45-1.98; BW: 0.95-1.2; WL: 0.54-0.64; CPL: 0.45-0.51; CPW: 0.62-0.74; RW: 0.17-0.19; RL: 0.1-0.11; HW: 0.62-0.74; AL: 0.91-0.99; AL3: 0.21-0.24. WBL: 0.59-0.66; ALHW: 1.28-1.6; ALWL: 1.44-1.83; WLHW: 0.83-0.92; WCPL: 1.35-1.55; CPRW: 3.44-4.06.

*5th instar chaetotaxy:* Head setae simple (max length at anterior margin 0.11-0.13); ocular seta simple, inconspicuous (max length 0.04-0.06); primary post-ocular seta simple or narrowly capitate (max length 0.06-0.08); secondary post-ocular seta simple (max length 0.06-0.09). Dorsal thoracic setae short simple (max length 0.05-0.09). Prominent wing pad setae max length 0.08-0.11; forewing and hindwing pads with simple and capitate setae; forewing pad prominent setae 4-7, simple or distinctly capitate, marginal (1 apical seta capitate or simple, remainder simple); hindwing pad prominent setae two, simple or distinctly capitate, marginal (1 apical, 1 proximal), apical seta paired with small simple seta; proximal setae simple (sometimes reduced); small simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on anterior tergites, long simple (max length 0.07-0.11), prominent caudal plate setae absent or if present, 4-7 simple (sometimes with one centrally and posteriorly placed); sectasetae four pairs; marginal abdominal setae (other than sectasetae) three or four pairs (4<sup>th</sup> frequently reduced), simple, narrowly or distinctly capitate (max length 0.1-0.14); pleurite setae paired simple (distal sometimes slightly capitate). Legs with simple setae only (max length 0.06).

*Host plant:* *Genista florida* var. *maroccana*.

*Distribution:* Continental: Morocco.

*Notes:* Occurs in the High Atlas mountains on a variety of *Genista florida* endemic to this region. The variety of *Genista florida* occurring in Portugal was found to host a *Livilla* species.

*Material examined:* MOROCCO: 44Γ, 40E, 10 nymphs, High Atlas, just north of Tizi n' Test pass, 30°50'N 8°30'W, c. 2080 m, 19.vi.1998 (DP 238). 3Γ, 5E, 3 nymphs, High Atlas, rd to Oukaïmeden, Vallée de l'Ourika, 31°10'N 7°45'W, c. 2000 m, 1.v.1999 (DP 324). 22Γ, 29E, 9n, High Atlas, c. 2 km blw Oukaïmeden, Vallée de l'Ourika, 31°08'N 7°40'W, c. 2600 m, 1.v.1999 (DP 325.1). 6Γ, 3E, High Atlas, just S of Tizi n' Test, 30°50'N 8°28'W, c. 2000 m, 2.v.1999 (DP 329).

***Arytinnis berber* sp. nov. (13)**

(Figs 16 & 25D)

*Adult*

*Colour:* Bright green or grey-green; forewing clear, veins uniform light brown.

*Structure:* Surface forewing spinules present in all cells, but reduced in one or more cells; distribution of spinules uniform, sparse: less than 40 per 0.1mm<sup>2</sup>; apical spines in wing cells cu<sub>1</sub>, m<sub>1</sub> and m<sub>2</sub>, but absent, or occasionally few present in cell r<sub>2</sub>. Antennae short; genal cones very short, terminal setae not darkly pigmented. Distal proboscis segment mid-length. Paramere short, in lateral view with an apically thin neck above a medially positioned blade produced on the external side and directed anteriorly, sclerotized apex dorsally rounded with slight anterior projection, in dorsal view contiguous anteriorly with inner margin straight edged; proctiger slightly inflated posteriorly towards the base; aedeagus distal segment with a flattened, shallow hook, tip of aedeagus hook blunt; male subgenital plate dorsal profile more or less straight and horizontal, or slightly raised anteriorly. Female proctiger dorsal profile more or less straight from anus to apex; subgenital plate ventral profile shallowly curved.

*Adult measurements and ratios:* (3Γ, 2E) total length: Γ 2.52-2.6, E 2.84; forewing: Γ length 1.95-2.16 width 0.85-0.92, E length 2.24-2.3 width 0.94-0.97; pterostigma length Γ 0.53-0.62, E 0.61-0.62; hindwing length Γ 1.63-1.78, E 1.8-1.88; head width: Γ 0.66-0.7, E 0.69-0.72; antennal length: 1.22-1.31; genal cone length: 0.06-0.1; distal proboscis segment length: 0.14-0.16. WLPT: 3.48-3.77; ALHW: 1.77-1.98; GCVL: 0.33-0.53; WLHW: 2.95-3.25; VLW: 0.45-0.5; WLW: 2.29-2.38; CUR: 1.47-1.76; MR: 0.48-0.6; RMCU: 5.12-6.48; TLFL: 1.14-1.18; TLHW: 0.71-0.81; SCHW: 0.83-0.88; ATIB: 0.24-0.3; MTIB: 0.27-0.31; PBHW: 0.2-0.23; ATMT: 0.88-1.07. *Adult genitalia* Γ: MP: 0.22-0.23; PL: 0.33-0.34; AEL: 0.23-0.24; AEH: 0.07-0.08. MPHW: 0.33; PLHW: 0.49-0.5; MPPL: 0.67-0.68; AEPL: 0.68-0.73; MSLH:

1.19-1.36; AHS: 0.31-0.33; PLSH: 1.27-1.36. E: FP: 0.67-0.69; FSP: 0.43-0.44; RL: 0.17-0.19; OV: 0.15-0.16; EL: 0.27-0.3. FPHW: 0.96-0.97; FPSP: 1.52-1.6; FPCR: 3.63-3.94; OLSP: 0.34-0.37; FEOL: 1.84.

### *Nymph*

*Colour:* 5<sup>th</sup> instars orange-yellow.

*Structure:* Antennal segments seven.

*5th instar measurements and ratios:* (specimens 4) BL: 1.25-1.48; BW: 0.83-0.95; WL: 0.47-0.5; CPL: 0.4-0.41; CPW: 0.57-0.62; RW: 0.16-0.17; RL: 0.1-0.11; HW: 0.54-0.57; AL: 0.77-0.8; AL3: 0.17-0.19. WBL: 0.64-0.71; ALHW: 1.38-1.48; ALWL: 1.6-1.68; WLHW: 0.86-0.89; WCPL: 1.39-1.53; CPRW: 3.41-3.88.

*5th instar chaetotaxy:* Head setae simple (max length at anterior margin 0.11-0.13) ocular seta simple or narrowly capitate, dark, conspicuous (max length 0.05-0.07); primary and secondary post-ocular setae distinctly capitate (max length 0.05-0.1). Dorsal thoracic setae short simple and long, stout capitate (max length 0.07-0.1). Prominent wing pad setae max length 0.09-0.1; forewing and hindwing pads with simple and capitate setae; forewing pad prominent setae 3-7, distinctly capitate, marginal, proximal seta distinctly capitate or rarely indistinct; hindwing pad prominent setae 2-3, simple or distinctly capitate, marginal (1-2 apical, 1 proximal), proximal seta simple or distinctly capitate, apical seta paired with small capitate or small simple seta; small simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on anterior tergites, long capitate (max length 0.07-0.1), prominent caudal plate setae absent; sectasetae four pairs; marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate (max length 0.11-0.12); pleurite setae paired simple or paired capitate and simple. Legs with simple setae only (max length 0.04).

*Host plant:* *Genista segonnei*.

*Distribution:* Continental: Morocco.

*Notes:* Occurs in the Anti-Atlas mountains. The host plant is locally common in isolated populations, but this species was not common in either of the locations sampled.

*Etymology:* Named for the Berber culture of the Anti-Atlas region.

*Type material:* Holotype ♂ (slide mounted), MOROCCO: Anti-Atlas, SE slopes of Jbel Lekst, blw Tagudicht Aitsmaon, 29°42'N 9°05'W, c. 1500 m, 3.v.1999 (BMNH). Paratypes 2♂, 1♀, 4 nymphs, as for holotype (BMNH). 1♂, 1♀, 4 nymphs, as for holotype (NHMB).

*Other material examined:* MOROCCO: 2♂, Anti-Atlas, just W of Col du Kerdous, 29°30'N 9°15'W, 1050 m, 23.iii.1999 (DP 302). 5♂, 1♀, as for holotype (DP 332).

#### Genus *Arytaina* Foerster

*Arytaina* Foerster, 1848: 69; Loginova, 1977: 66; Hodkinson and Hollis, 1987: 10. Type species: *Psylla spartii* Hartig, 1841 (= *Psylla genistae* Latreille, 1804), designated by Oshanin, 1912: 128

*Amblyrhina* Löw, 1879: 599; Loginova, 1977: 66. Type species: *Psylla torifrons* Flor, by monotypy; synonymized by Hodkinson and Hollis, 1987

*Psyllopa* Crawford, 1911: 628. Type species: *Psyllopa magna* Crawford, by original designation; synonymized by Crawford, 1914: 122

*Comment:* Two of the Canary Island species originally described in *Arytaina* (*A. devia* and *A. nubivaga*) by Loginova (1976) were transferred to *Arytainilla* by Hodkinson and Hollis (1987) based on forewing shape and the peculiar forms of the male paramere. However, these species are now returned to *Arytaina* based on the following characters: absence of a costal break or pterostigma, shape of the male proctiger and the female genitalia, and reduced number of sectasetae in 5<sup>th</sup> instar nymphs. The two larger species, *A. nubivaga* and *A. vittata* sp. nov. are most similar to *A. genistae* in general body and wing colouration, in the shape of the hindwing costal margin and the aedeagus hook, and in the relative segment lengths of the hind leg. In the same respects *A. devia* is more similar to *A. adenocarpi*. Any similarity in the paramere shape between *A. devia* and *A. nubivaga* may therefore be due to convergence.

Key to adults of the three Canary Island species of *Arytaina*.

- 1 Forewing short and broad, length less than 2.5 x width, widest in the apical third with a broadly rounded apex, veins and apical cells ( $cu_1$ ,  $m_1$  and  $m_2$ ) with small dark patches at the margin of the wing; hindwing costal margin slightly concave, not darkly pigmented; antennae shorter than 1.9 mm; head width less than 0.9 mm; genal cones short ( $< 0.14$  mm); distal proboscis segment longer, greater than 0.15 x head width; male paramere apex with a single anteriorly and interiorly directed hook; aedeagus distal segment with a more flattened, shallow hook; female proctiger equal to, or shorter than 0.9 mm; ovipositor valvulae dorsalis shorter than 0.2 mm; hind leg tibia longer than the femur, tibia length  $\geq 0.75$  x head width, apical and metatarsi relatively short, each about 0.25-0.35 x tibia length (on *Chamaecytisus*; Gran Canaria, Tenerife, La Gomera, La Palma) ..... *devia* Loginova
- Forewing long and narrow, length greater than 2.5 x width, margins more or less parallel, apex more acutely rounded, veins and apical cells without small dark patches at the wing margin, but with extensive brown patches in the apical half of the wing; hindwing costal margin markedly concave and darkly pigmented; antennae long ( $> 1.9$  mm); head width greater than 1 mm; genal cones long ( $> 0.14$  mm); distal proboscis segment short, less than 0.15 x head width; male paramere apex with an interiorly directed double claw; aedeagus distal segment with a well developed, curved hook; female proctiger longer than 0.9 mm; ovipositor valvulae dorsalis longer than 0.2 mm; hind leg tibia shorter than the femur, tibia length about 0.5 x head width, apical and metatarsi long, each about 0.5 x tibia length (Figs 1H & 1J) ..... 2
- 2 Abdomen without dark, longitudinal dorsal stripe; male paramere shorter ( $< 0.33$  mm) and broader, length less than 0.9 x subgenital plate height, and less than 0.32 x head width, interior medial ridge weakly developed and supporting relatively long setae (visible clearly only in posterior view) (on *Spartocytisus supranubius*; Tenerife) (Fig. 18B) .....  
..... *nubivaga* Loginova
- Abdomen with dark, longitudinal dorsal stripe (more distinct in females); male paramere longer ( $> 0.33$  mm) and narrower, length greater than 0.9 x subgenital plate height, and greater than 0.32 x head width, interior medial ridge extended inwards, such that inner margins of the ridge are virtually straight and nearly contiguous when parameres close, supporting short setae (visible clearly only in posterior view) (on *Spartocytisus*; La Gomera, La Palma, El Hierro) (Figs 17 & 18A) ..... *vittata* sp. nov.

Key to 5<sup>th</sup> instars nymphs of the three Canary Island species of *Arytaina*.

- 1 Antennae shorter than 1.1 mm; forewing pad shorter than 0.63 mm; primary and secondary post-ocular setae distinctly capitate; dorsal thoracic setae short simple and long capitate; forewing and hindwing pads with capitate setae only, each with five or more prominent capitate setae present on both wing pad surface and margins, proximal setae distinctly capitate; marginal abdominal pleurite setae paired capitate and simple; marginal abdominal capitate setae extremely long (max length 0.27-0.35); foreleg tibia with capitate setae present (on *Chamaecytisus*; Gran Canaria, Tenerife, La Gomera, La Palma) (Fig. 24B) ...  
 ..... *devia* Loginova
- Antennae longer than 1.1 mm; forewing pad longer than 0.63 mm; primary and secondary post-ocular setae simple or narrowly capitate; dorsal thoracic setae short simple; forewing and hindwing pads with simple and capitate setae, typically each with one or two prominent capitate (occasionally simple) setae present on the wing pad margin, proximal setae small simple or indistinct; marginal abdominal pleurite setae paired simple; marginal abdominal capitate setae shorter (max length 0.14-0.22); foreleg tibia without capitate setae  
 ..... 2
- 2 Abdominal sectasetae two pairs (in 3<sup>rd</sup> and 4<sup>th</sup> positions); forewing pad length (> 0.7 mm) greater than 0.87 x head width; circumanal ring width less than 0.25 x caudal plate width; ocular, thoracic and prominent leg setae longer; dorsal caudal plate with six prominent setae; middle and hind tibiae each with more than two capitate setae (on *Spartocytisus supranubius*; Tenerife) (Fig. 24D) ..... *nubivaga* Loginova
- Abdominal sectasetae one pair (in 3<sup>rd</sup> position, apical pair small simple or rod setae); forewing pad length (< 0.7 mm) less than 0.87 x head width; circumanal ring width more than 0.25 x caudal plate width; ocular, thoracic and prominent leg setae shorter; dorsal caudal plate with two prominent setae; middle and hind tibiae each with one capitate seta distally (on *Spartocytisus*; La Gomera, La Palma, El Hierro) (Fig. 24C) ... *vittata* sp. nov.

*Arytaina devia* Loginova **comb. rev.**

(Fig. 24B)

*Arytaina devia* Loginova, 1976: 14*Arytainilla devia* (Loginova) Hodkinson & Hollis, 1987: 11

*Adult Colour:* Generally brown or dark grey, though females exhibit more colour variation than males and are frequently lighter coloured (recently emerged adults may be green). The abdominal intersegment colour is yellow-green, and the thorax is paler chestnut with dark bands. Forewing membrane without distinct pattern but apical cells have faint brown patches and small darker patches at the margin of cells  $cu_1$ ,  $m_1$  and  $m_2$ , forewing veins mid-brown with dark spots at the apices where the veins intersect the wing margin.

*Adult Description:* Loginova (1976).

*Nymph*

*Colour:* 5<sup>th</sup> pale grey-green or blue green with black tergites; terminal antennal segment darker brown.

*Structure:* Forewing pads and abdomen broadly rounded apically. Antennal segments seven. Tergites extensively reduced on the thorax, typically not extending to the lateral margin on the abdomen. Arolium pad long, broadly expanded apically, usually with a distinct medial groove and long petiole. Circumanal ring broadly crescent-shaped with well rounded anterior lobes, outer ring not contiguous with the apical abdominal margin and with a single row of pores.

*5th instar measurements and ratios:* (specimens 7) BL: 1.6-1.9; BW: 1.08-1.23; WL: 0.57-0.6; CPL: 0.48-0.54; CPW: 0.7-0.76; RW: 0.16-0.17; RL: 0.1-0.11; HW: 0.66-0.77; AL: 0.93-1.02; AL3: 0.22-0.27. WBL: 0.59-0.68; ALHW: 1.32-1.44; ALWL: 1.58-1.76; WLHW: 0.8-0.91; WCPL: 1.37-1.58; CPRW: 4-4.59.

*5th instar chaetotaxy:* Head setae simple and narrowly capitate (max length at anterior margin 0.16-0.2); antennal setae simple; ocular seta simple, dark, conspicuous (max length 0.08-0.11); primary post-ocular seta distinctly capitate (max length 0.1-0.11); secondary post-ocular seta distinctly capitate (max length 0.13-0.18). Dorsal thoracic setae short simple and long capitate (max length 0.13-0.17). Prominent wing pad setae max length 0.14-0.17; forewing and hindwing pads with capitate and simple setae; forewing pad prominent setae 9-14, distinctly capitate, surface and marginal (typically 2-4 surface setae with the remainder marginal); hindwing pad prominent setae 5-6, distinctly capitate, surface and marginal; proximal setae

distinctly capitate; small simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on anterior tergites, long capitate (max length 0.14-0.17), prominent caudal plate setae present, four (Gran Canaria) - six (Tenerife, La Gomera and La Palma), distinctly capitate; sectasetae absent (Tenerife, La Gomera and La Palma) or if present, one pair (Gran Canaria); marginal abdominal setae (other than sectasetae) four pairs, distinctly capitate (max length 0.27-0.35); pleurite setae paired capitate and simple. Legs with capitate setae present (max length 0.14-0.18); capitate foreleg setae present on femur and tibia, on the tibia two (1 proximal, 1 distal); capitate middle leg setae present on femur and tibia, on the tibia 4-5; capitate hind leg setae present on femur and tibia, on the tibia 5-6.

*Host plant:* *Chamaecytisus proliferus*, on all three recognized subspecies (Acebes Ginovés et al., 1991).

*Distribution:* Canary Islands: Gran Canaria, Tenerife, La Gomera and La Palma.

*Notes:* Occurs on the two central and two of the western Canary Islands (apparently absent from El Hierro). It is sympatric with *A. dividens* on Gran Canaria, Tenerife and La Gomera and with *A. modica* on La Palma. No specificity or preference for intraspecific host taxa was detected.

*Biology:* Only a few large nymphs (5<sup>th</sup> instars) were found during April-May, when all of the smaller nymphs (1<sup>st</sup>-3<sup>rd</sup> instars) examined were those of the sympatric species *A. dividens* or *A. modica*. However, it was the only species collected from one location in late July when numerous 1<sup>st</sup>-5<sup>th</sup> instars were found on leaf buds, and eggs were found singly on the outer surface of young leaves. This suggests asynchronous development, as with other sympatric species, with *A. devia* developing later than either *A. dividens* or *A. modica*.

*Comment:* Loginova (1976) designated specimens from Gran Canaria and La Palma as ssp. *insularis*, citing the more slender and elongate paramere. I have retained this rank and since no type was published, I have designated the specimen - La Palma, El Paso, 26.v.1947, 1Γ - as a lectotype. 5<sup>th</sup> instar nymphs from Gran Canaria can be separated from those of the other three islands by the presence of sectasetae, suggesting a basal position for the Gran Canarian population in the colonization of the Canary Islands. Evidence that the reduction in number of sectasetae in this genus is derived is taken from a comparison with the ontogeny of this character in nymphs of the type species, *A. genistae*. The 5<sup>th</sup> instars of *A. genistae* have one or two pairs of sectasetae that may be either reduced or simple, however, 3<sup>rd</sup> instars have four



pairs of well developed sectasetae and 4<sup>th</sup> instars have three pairs. Similarly, *A. adenocarpi* 4<sup>th</sup> instars have four pairs of sectasetae but 5<sup>th</sup> instars have only two pairs.

This study did not survey the eastern Canary Islands (Fuerteventura and Lanzarote), where there are no recorded host plants in the Genisteae, but one female was recorded from Fuerteventura by Loginova (1976).

*Material examined:* (ex *Chamaecytisus proliferus* unless otherwise stated) CANARY ISLANDS. GRAN CANARIA: 1Γ, NE of Tejeda, rd to Cruz de Tejeda, 28°0'N 15°36'30"W, 1300 m, 5.vii.1997 (DP 38). 22Γ, 23E, 3 nymphs, rd San Bartolomé de Tirajana to Fataga, 27°54'30"N 15°34'30"W, 920 m, 16.iv.1998 (DP 161). 2Γ, 3E, base of Risco Blanco, 27°56'N 15°33'30"W, 1150 m, ex *Teline rosmarinifolia*, 18.iv.1998 (DP 165). 17Γ, 19E, 9 nymphs, Barranco de Mogán, abv town of Mogán, 27°54'30"N 15°42'30"W, c. 500 m, 18.iv.1998 (DP 167). 5Γ, 2E, 1 nymph, valley NE of Tejeda, btw Cruz de Tejeda and Tejeda, 27°59'30"N 15°35'W, 1300 m, 19.iv.1998 (DP 168). 4Γ, 3E, rd btw Moya and St Bartolome de Fontanales, 28°5'45"N 15°35'15"W, c. 700 m, 19.iv.1998 (DP 169). 1Γ, 1E, just N of Cruz de Tejeda, rd Cruz de Tejeda to Valleseco, 28°30'N 15°35'30"W, c. 1500 m, 20.iv.1998 (DP 174). 1E, Gran Canaria, rd Cruz de Tejeda to San Mateo 28°00'N 15°34'30"W, c. 1220 m, 20.iv.1998 (DP 176). TENERIFE: 4Γ, 5E, rd to Parque Nacional del Teide, Miradores de la Cumbre, 28°23'30"N 16°26'W, 1800 m, 22.vi.1997 (DP 6). 1E, just N of Aguamansa, 28°21'30"N 16°30'W, 950 m, 29.vi.1997 (DP 23.2). 1E, mirador N of Santiago del Teide, Barranco Seco, 28°18'30"N 16°49'30"W, 1000 m, ex *Retama monosperma*, 2.vii.1997 (DP 31). 13Γ, 12E, mirador NW of Santiago del Teide, Barranco Seco, 28°18'30"N 16°49'30"W, 1000 m, 2.vii.1997 (DP 32). 14Γ, 16E, 1 nymph, rd El Teide to Arafo 28°23'N 16°25'W, 1250 m, 9.vii.1997 (DP 53). 1Γ, 5 nymphs, blw Mirador de la Cumbre Norte, 28°22'30"N 16°27'30"W, c. 1850 m, 10.iv.1998 (DP 155). 3Γ, 2E, Barranco del Rey, NW of Arona, 28°06'30"N 16°41'30"W, c. 700 m, 10.v.1998 (DP 185). 1E, as for previous except, ex *Teline osyroides* (DP 186). 5Γ, 6E, 1 nymph, abv Vilaflor, 28°10'30"N 16°39'W, c. 1900 m, 10.v.1998 (DP 188). 1Γ, 2E, 20 nymphs, rd Granadilla de Abona to Vilaflor, 28°08'N 16°37'W, < 1000 m, 28.vii.2000 (DP 342). LA GOMERA: 26Γ, 30E, 5 nymphs, rd Arure to Las Hayas, 28°7'30"N 17°18'30"W, 900 m, 13.vii.1997 (DP 68). 1Γ, as for previous except, ex *Spartocytisus filipes* (DP 69). 4Γ, 4E, as for previous except, ex *Retama monosperma* (DP 70). LA PALMA: 2Γ, 13 nymphs, SE rd Santa

Cruz to La Caldera, abv Fuente de Olén, 28°44'N 17°49'W, 1850 m, 16.vii.1997 (DP 79). 22Γ, 26E, rd to La Cumbrecita, c. 3-5 km N of El Paso rd, 28°39'30"N 17°50'45"W, c. 900 m, 16.v.1998 (DP 189). 10Γ, 8E, NW rd from Llano Negro to La Caldera, 28°48'N 17°55'30"W, c. 1050 m, 19.v.1998 (DP 201).

*Arytaina nubivaga* Loginova **comb. rev.**

(Fig. 24D)

*Arytaina nubivaga* Loginova, 1976: 12

*Arytainilla nubivaga* (Loginova) Hodkinson & Hollis, 1987: 11

*Adult Colour:* Males generally dark brown, grey or chestnut, females with abdominal intersegment colour yellow-grey or green, thorax orange-red with grey bands. Genal cones, legs and proximal antennal segments yellow-grey, terminal antennal segments darker brown. Forewing cells with brown patches, veins uniform mid-brown; hindwing costal and claval margins darkly pigmented.

*Adult Description:* Loginova (1976).

*Nymph*

*Colour:* 4<sup>th</sup>-5<sup>th</sup> instars cream with black tergites. Sclerites, wing pads, legs and terminal antennal segments darker brown.

*Structure:* Forewing pads and abdomen broadly rounded apically. Antennal segments seven. Tergite structure extensively reduced on the thorax, typically not extending to the lateral margin on the abdomen. Arolium pad long, broadly expanded apically, usually with a distinct medial groove and long petiole. Circumanal ring broadly crescent-shaped with well rounded anterior lobes, outer ring not contiguous with the apical abdominal margin and with a single row of pores.

*5th instar measurements and ratios:* (specimens 5) BL: 1.73-1.88; BW: 1.18-1.28; WL: 0.71-0.74; CPL: 0.6-0.63; CPW: 0.84-0.87; RW: 0.18-0.19; RL: 0.12-0.13; HW: 0.77-0.81; AL: 1.18-1.23; AL3: 0.29-0.3. WBL: 0.66-0.7; ALHW: 1.49-1.53; ALWL: 1.59-1.68; WLHW: 0.89-0.94; WCPL: 1.35-1.42; CPRW: 4.47-4.83.

*5th instar chaetotaxy:* Head setae simple (max length at anterior margin 0.11-0.14); antennal setae simple; ocular seta simple, conspicuous (max length 0.06-0.07); primary post-ocular seta

simple or narrowly capitate (max length 0.1-0.11); secondary post-ocular seta simple (max length 0.05-0.09). Dorsal thoracic setae short simple (max length 0.06-0.08). Prominent wing pad setae max length 0.14-0.15; forewing and hindwing pads with simple and capitate setae; forewing pad prominent setae 2-5, simple or narrowly capitate, surface and marginal; hindwing pad prominent setae surface and marginal with two apical, distinctly or narrowly capitate; proximal setae absent (indistinct from simple surface setae in 5<sup>th</sup> instars, more prominent in 3<sup>rd</sup> and 4<sup>th</sup> instars); numerous small simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on anterior tergites, short simple with long simple and capitate (frequently narrow, max length 0.12), prominent caudal plate setae present, six, narrowly or distinctly capitate; sectasetae two pairs; marginal abdominal setae (other than sectasetae) four pairs, narrowly or distinctly capitate (4<sup>th</sup> pair sometimes simple) (max length 0.17); pleurite setae paired simple. Legs with capitate setae present (max length 0.14-0.15); capitate foreleg setae present on femur only; capitate middle and hind leg setae present on femur and tibia, on the tibia three (1 large distal, 2 smaller proximal).

*Host plant:* *Spartocytisus supranubius*.

*Distribution:* Canary Islands: Tenerife.

*Notes:* Known only from Tenerife where the host plant is abundant in the sub-alpine zone. *A. nubivaga* is relatively common on Tenerife but is apparently absent from La Palma, the other high altitude island where the host occurs.

*Biology:* Eggs were found under the small floral bracts at the base of the clayx.

*Comment:* The host plant on La Palma is threatened by over grazing (less than 500 individuals recorded in 1988 (Palomares Martínez, 1997)). The dramatic reduction of *S. supranubius*, once considered to be widespread on La Palma, raises the possibility that *A. nubivaga* may have once been present but subsequently become extinct on this island with the demise of the host plant.

*Material examined:* CANARY ISLANDS. TENERIFE: 2♂, 6 nymphs, 12 km NE of Parque Nacional del Teide, 28°20'30"N 16°29'W, 2080 m, 23.vi.1997 (DP 7). 1♂, 2E, 30 nymphs, 28°18'30"N 16°33'W, 2-3 km NE of Parque Nacional del Teide, 2070 m, 23.vi.1997 (DP 10). 17♂, 18E, c. 2 km N of Observatory, Las Cañadas, 29°19'N 16°29'30"W, c. 2200 m, 5.iv.1998 (DP 154).

*Arytaina vittata* sp. nov. (14)

(Figs 17, 24C, 1H &amp; 1J)

*Adult*

*Colour:* Males generally darker than females, head and thorax brown or paler chestnut, thorax with grey bands, genal cones pale grey or blue-grey, legs grey to yellow-grey, abdomen bright green to yellow-green with distinctive dark brown to black dorsal stripe, male abdomens sometimes darker grey or chestnut. Apical forewing cells with brown patches, but these are less extensive than in *A. nubivaga*, forewing veins uniform mid- or dark brown; hindwing costal and claval margins darkly pigmented.

*Structure:* Forewing with margins more or less parallel, apex somewhat acute; costal break and pterostigma absent; the middle, but not the apex, of vein Rs is curved towards the costal wing margin; surface forewing spinules absent from cells c+sc and r<sub>1</sub>, but usually present, though often reduced, in other cells, distribution uniform, sparse: less than 40 per 0.1 mm<sup>2</sup>; apical spines in wing cells cu<sub>1</sub>, m<sub>1</sub>, m<sub>2</sub>, and few in cell r<sub>2</sub>; hindwing costal margin markedly concave. Antennae long, with ten segments; head not, or only weakly deflexed downwards with genal cones in approximately the same plane as the vertex; genal cones long, commencing ventrally relative to the vertex, with a distinct depression between the vertex and the genal cones, terminal setae typically shorter than the vertex, occasionally longer. Distal proboscis segment short. Tibia shorter than the femur, tarsi long; metatarsal spur one. Paramere short, in lateral view with a blade on the exterior-anterior margin, and with an internal medial ridge that, in posterior view is almost contiguous when the parameres are closed, sclerotized apex with a double claw, displaced to the interior and posterior of the top of the paramere, in dorsal view contiguous anteriorly, with the inner margin concave; paramere shorter than the proctiger; proctiger not inflated towards the base but with a pronounced posterior extension apically; aedeagus distal segment with a well developed, curved hook, tip of aedeagus hook acute; male subgenital plate dorsal profile more or less straight and horizontal. Female proctiger dorsal profile with a slight post anal depression, but subsequently more or less straight, apex bluntly rounded; subgenital plate ventral profile shallowly curved, apex acute; ovipositor valvulae ventralis slender, apex acute; height of valvulae dorsalis as great, or greater than valvulae ventralis, dorsally convex, wedge-shaped and tapering to the apex; eggs with a stout lateral pedicel.

*Adult measurements and ratios:* (5 $\Gamma$ , 5E) total length:  $\Gamma$  3.32-3.88, E 3.68-4.33; forewing:  $\Gamma$  length 2.7-2.88 width 0.98-1.05, E length 3-3.2 width 1.03-1.13; hindwing length  $\Gamma$  2.2-2.38, E 2.4-2.65; head width:  $\Gamma$  1.01-1.03, E 1.08-1.13; antennal length: 2.15-2.41; genal cone length: 0.15-0.2; distal proboscis segment length: 0.13-0.14. ALHW: 2.07-2.31; GCVL: 0.57-0.71; WLHW: 2.67-2.87; VLW: 0.45-0.5; WLW: 2.68-2.91; CUR: 1.65-2.03; MR: 0.41-0.52; RMCU: 4.71-6.66; TLFL: 0.84-0.91; TLHW: 0.44-0.5; SCHW: 0.7-0.77; ATIB: 0.42-0.48; MTIB: 0.43-0.5; PBHW: 0.12-0.14; ATMT: 0.88-1.04. *Adult genitalia*  $\Gamma$ : MP: 0.46-0.49; PL: 0.34-0.36; AEL: 0.33-0.37; AEH: 0.08-0.09. MPHW: 0.46-0.48; PLHW: 0.33-0.35; MPPL: 1.31-1.44; AEPL: 0.97-1.03; MSLH: 1.25-1.4; AHS: 0.23-0.26; PLSH: 0.94-1.03. E: FP: 0.91-1.04; FSP: 0.6-0.7; RL: 0.25-0.29; OV: 0.2-0.22; EL: 0.25-0.33. FPHW: 0.84-0.92; FPSP: 1.48-1.52; FPCR: 3.56-4; OLSP: 0.31-0.33; FEOL: 1.41.

### *Nymph*

*Colour:* 1<sup>st</sup>-2<sup>nd</sup> instars cream and orange or black, 3<sup>rd</sup>-5<sup>th</sup> instars cream and orange, pale yellow or blue-green, with black tergites. Sclerites, wing pads, legs and terminal antennal segments darker brown.

*Structure:* Forewing pads and abdomen broadly rounded apically. Antennal segments seven. Tergite structure extensively reduced on the thorax, typically not extending to the lateral margin on the abdomen. Arolium pad long, broadly expanded apically, usually with a distinct medial groove and long petiole. Circumanal ring broadly crescent-shaped with well rounded anterior lobes, outer ring not contiguous with the apical abdominal margin and with a single row of pores.

*5th instar measurements and ratios:* (specimens 5) BL: 1.83-2.3; BW: 1.15-1.35; WL: 0.65-0.77; CPL: 0.57-0.65; CPW: 0.76-0.87; RW: 0.22-0.24; RL: 0.13-0.16; HW: 0.79-0.9; AL: 1.18-1.28; AL3: 0.28-0.3. WBL: 0.59-0.63; ALHW: 1.42-1.49; ALWL: 1.66-1.85; WLHW: 0.78-0.86; WCPL: 1.26-1.35; CPRW: 3.45-3.7.

*5th instar chaetotaxy:* Head setae simple (max length at anterior margin 0.1-0.15); antennal setae simple; ocular seta simple, inconspicuous (max length 0.03-0.06); primary post-ocular seta simple or narrowly capitate (max length 0.07); secondary post-ocular seta absent or if present simple (max length 0.05). Dorsal thoracic setae short simple (max length 0.03-0.05). Prominent wing pad setae max length 0.1; forewing and hindwing pads with simple and capitate setae; forewing pad with one prominent apical seta, distinctly or narrowly capitate

(occasionally reduced to small simple); hindwing pad with two prominent apical setae, distinctly capitate; proximal setae absent; small simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on anterior tergites, short simple (or very slightly capitate, max length 0.05-0.09), two prominent caudal plate setae present, narrowly capitate; sectasetae one pair in the 3<sup>rd</sup> position (apical pair in the 4<sup>th</sup> position are small simple or rod setae); marginal abdominal setae (other than sectasetae) four pairs, distinctly capitate (4<sup>th</sup> pair sometimes simple) (max length 0.14.-0.22); pleurite setae paired simple. Legs with capitate setae present (max length 0.07-0.08); capitate foreleg setae absent; capitate middle leg setae present on femur and tibia, on the tibia one (distal); capitate hind leg setae present on femur and tibia, on the tibia one (distal).

*Host plant:* *Spartocytisus filipes*, *S. supranubius*.

*Distribution:* Canary Islands: La Gomera, La Palma, and El Hierro.

*Notes:* Occurs on the three most westerly islands. It is found throughout the host plant range, from dry lowland to sabinar and laurisilva habitat. On La Palma, it is sympatric with *Arytainilla serpentina* in the laurisilva habitat, where it is less common than the latter species.

*Biology:* Eggs, on *Spartocytisus filipes*, are laid in rows around the inside rim of the calyx, and in small clusters on the inner surfaces of corolla segments (Fig. 31A). Of 46 flowers examined, 35 were found to have between five, to more than 30 eggs per flower, the majority laid on the inner surface of the calyx which is persistent during development of the young fruit. In mid-May, small nymphs (1<sup>st</sup>-2<sup>nd</sup> instars) were observed in flowers on the corolla and calyx.

*Etymology:* Named for the dorsal, longitudinal stripe or 'vittae', particularly distinct in females, which makes this species easily recognisable in the field and distinguishes it from the closely related species, *A. nubivaga*.

*Comment:* *A. vittata* is very similar to *A. nubivaga*, and appears to represent a recent speciation event involving a host switch from the upland to the lowland *Spartocytisus* species. At present these two species do not occur on the same island. On La Palma *Spartocytisus supranubius* (the upland host) is rare and when sampled a few adults and nymphs of *A. vittata* were found. The lowland host, *Spartocytisus filipes*, is present but extremely rare on Tenerife, where no individuals were located for sampling. It is not apparent therefore, whether a host switch may have occurred on one island, or been coupled with colonization of a new island. *A. vittata* can be distinguished from *A. nubivaga* by the more slender paramere with an extended internal

ridge which is shallow in *A. nubivaga*, also by the adult colour (i.e. dorsal vittae) and the 5<sup>th</sup> instar nymph which has a single pair of sectasetae in *A. vittata*.

*Type material*: Holotype ♂ (slide mounted), CANARY ISLANDS. LA PALMA: Barranco de las Angustias, 28°40'30"N 17°55'W, c. 300 m, 18.v.1998 (BMNH). Paratypes 1♂, as for holotype (BMNH). 1♂, 1E, as for holotype (DZUL). 1E, as for holotype (NHMB). 1E, SE rd Santa Cruz to La Caldera, 28°45'N 17°49'30"W, 1950 m, ex *Spartocytisus supranubius*, 16.vii.1997 (BMNH). LA GOMERA: 2♂, 2E, S of Hermigua, 28°08'30"N 17°12'W, 500-600 m, 25.v.1998 (BMNH). 3♂, 1E, as for previous (NHMB). EL HIERRO: 5 nymphs, N coast btw Frontera and Sabinosa, 27°45'N 18°04'W, 300 m, 22.v.1998 (BMNH).

*Material examined*: (ex *Spartocytisus filipes* unless otherwise stated) CANARY ISLANDS. LA GOMERA: 8♂, 10E, Barranco del Agua, abv El Retamal, Valle Gran Rey, 28°7'N 17°18'30"W, 550 m, 13.vii.1997 (DP 66). 17♂, 16E, 7 nymphs, rd Arure to Las Hayas, 28°7'30"N 17°18'30"W, 900 m, 13.vii.1997 (DP 69). 21♂, 14E, S of Hermigua, 28°08'30"N 17°12'W, 500-600 m, 25.v.1998 (DP 220). 2♂, 8E, blw Roque Cano, 28°11'N 17°15'30"W, 300-400 m, 26.v.1998 (DP 222). LA PALMA: 1E, SE rd Santa Cruz to La Caldera, 28°45'N 17°49'30"W, 1950 m, ex *Spartocytisus supranubius*, 16.vii.1997 (DP 80.1). 6♂, 23E, Barranco de las Angustias, abv Los Llanos 28°41'N 17°53'30"W, 420 m, 17.vii.1997 (DP 83). 3 nymphs, La Caldera, 28°46'N 17°5'30"W, 2280 m, ex *Spartocytisus supranubius*, 17.vii.1997 (DP 85). 1E, nr Los Galguitos, Barranco de la Fuente, 28°46'N 17°46'W, 350 m, 17.v.1998 (DP 191). 4♂, 53E, 1 nymph, as for holotype (DP 193). 17♂, 15E, Barranco de Jurado, S of Tijarafe, 28°42'15"N 17°56'45"W, c. 600 m, 18.v.1998 (DP 197). 1♂, 15E, NE, from El Granel to Barlovento and Roque Faro, 200-500 m, 19.v.1998 (DP 198). EL HIERRO: 12♂, 11E, c. 5 km W of Frontera on road to Sabinosa, 27°45'N 18°03'30"W, 230 m, 10.vii.1997 (DP 58). 27♂, 13E, 13 nymphs, N coast btw Frontera and Sabinosa, 27°45'N 18°04'W, 300 m, 22.v.1998 (DP 213).

#### Genus *Livilla* Curtis

*Livilla* Curtis, 1836: 625; Loginova, 1977: 67; Hodkinson and Hollis, 1987: 19. Type species: *Livilla ulicis* Curtis, by monotypy

*Floria*, Löw, 1879: 594; Loginova, 1977: 66. Type species: *Psylla pyrenaea* Mink, designated by Oshanin, 1912: 128; synonymized by Hodkinson and Hollis, 1987: 19

*Alloeoneura* Löw, 1879: 594; Loginova, 1977: 67. Type species: *Arytaina radiata* Foerster, by monotypy; synonymized by Hodkinson and Hollis, 1987: 19

*Floria* (*Floriella*) Ramírez Gómez, 1956: 87. Type species: *Psylla pyrenaea* Mink [objective synonym of *Floria*]

*Livilla monospermae* Hodkinson

(Figs 24A, 1E & 1K)

*Livilla monospermae* Hodkinson, 1990: 29

*Adult Colour*: Green to yellow-green, thorax usually with dark bands, head and legs sometimes brown, femora, genal cones and terminal antennal segments darker brown; forewing membrane with distinct, dark brown transverse apical pattern, veins uniform light brown.

*Adult Description*: Hodkinson (1990).

*Nymph*

*Colour*: 1<sup>st</sup>-2<sup>nd</sup> instars cream with black tergites, 3<sup>rd</sup>-4<sup>th</sup> instars orange-brown with black tergites, 5<sup>th</sup> instars pale blue-green or yellow with black tergites. Sclerites, wing pads, legs and terminal antennal segments darker brown.

*Structure*: Forewing pads and abdomen broadly rounded apically. Antennal segments seven. Tergites extensively reduced on the thorax, typically not extending to the lateral margin on the abdomen. Arolium pad long, broadly expanded apically, usually with a distinct medial groove and long petiole. Circumanal ring shape broadly crescent-shaped with well rounded anterior lobes, outer ring not contiguous with the apical abdominal margin and with a single row of pores.

*5th instar measurements and ratios*: (specimens 4) BL: 1.95-2.23; BW: 1.15-1.23; WL: 0.63-0.69; CPL: 0.56-0.59; CPW: 0.84-0.91; RW: 0.22-0.24; RL: 0.12-0.14; HW: 0.75-0.84; AL: 1.03-1.1; AL3: 0.25-0.28. WBL: 0.58-0.67; ALHW: 1.29-1.47; ALWL: 1.59-1.75; WLHW: 0.79-0.85; WCPL: 1.48-1.63; CPRW: 3.58-3.96.

*5th instar chaetotaxy*: Head setae simple and distinctly capitate (max length at anterior margin 0.09-0.1); antennal setae simple and capitate (small capitate on 1<sup>st</sup>, and distally on 3<sup>rd</sup> and 5<sup>th</sup> segments); ocular seta small, capitate (max length 0.01-0.05); primary post-ocular seta



distinctly capitate (max length 0.08); secondary post-ocular seta distinctly capitate (max length 0.04-0.07). Dorsal thoracic setae short capitate (max length 0.03-0.04). Prominent wing pad setae max length 0.12-0.14; forewing and hindwing pads with capitate setae only; forewing pad prominent setae 8-12, distinctly capitate, surface and marginal (7-10 marginal, 1 proximal, remainder surface); hindwing pad prominent setae 4-7, distinctly capitate, surface and marginal (2 apical, 1 proximal, 1-4 surface); proximal setae distinctly capitate; numerous small capitate setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on anterior tergites, short capitate (max length 0.02), prominent caudal plate setae absent (numerous small capitate); sectasetae four pairs; marginal abdominal setae (other than sectasetae) four pairs, distinctly capitate (max length 0.23); pleurite setae paired capitate and simple or capitate only (anterior pleurites with 2-3 capitate setae). Legs with capitate setae present (max length 0.1-0.14); on all legs capitate setae present on femora, tibiae and tarsi, on the tibia 3-4 larger, with numerous smaller capitate setae.

*Host plant: Retama monosperma.*

*Distribution:* Canary Islands: Tenerife, La Gomera, La Palma, and El Hierro.

*Comment:* This is the only representative of *Livilla* in the Canary Islands. It is present on four of the five central and western Canary Islands, and the apparent absence from Gran Canaria may be due to the restricted host plant distribution on this island. It is closely related to the widespread continental, *Retama*-feeding species, *Livilla retamae*.

*Material examined:* CANARY ISLANDS. TENERIFE: 3♂, 13E, 3 nymphs, c. 2 km S of Tamaimo, rd to Santiago del Teide, 28°15'N 16°48'30"W, 600 m, 29.vi.1997 (DP 28). 6♂, 13E, 5 nymphs, mirador N of Santiago del Teide, Barranco Seco, 28°18'30"N 16°49'30"W, 1000 m, 2.vii.1997 (DP 31). 3♂, 3E, blw Masca village, Barranco de Masca, 28°18'N 16°50'30"W, 550 m, 2.vii.1997 (DP 34). 2♂, 1E, La Laguna University, 18.vii.1997 (DP 87). LA GOMERA: 15♂, 5E, 3 nymphs, Barranco del Agua, abv El Retamal, Valle Gran Rey, 28°7'N 17°18'30"W, 550 m, 13.vii.1997 (DP 65). 66♂, 47E, 1 nymph, rd Arure to Las Hayas, 28°7'30"N 17°18'30"W, 900 m, 13.vii.1997 (DP 70). LA PALMA: 4♂, 1E, btw Las Nieves and Mirca, 28°42'N 17°46'30"W, 260 m, 16.vii.1997 (DP 77). 15♂, 9E, 10 nymphs, Barranco de las Angustias, 28°40'N 17°55'30"W, c. 300 m, 17.vii.1997 (DP 84). 11♂, 9E, 6 nymphs, Barranco de las Angustias, 28°40'15N 17°55'45"W, 350 m, 18.v.1998 (DP 196). EL HIERRO: 22♂, 12E,

16 nymphs, c. 50 m blw Mirador de la Peña, E rim of El Golfo, 27°48'30"N 17°59'W, 560 m, 12.vii.1997 (DP 62).

*Livilla ima* (Loginova) **comb. nov.**

(Fig. 23C)

*Arytainilla ima* Loginova, 1972: 19

*Adult Colour:* Bright or paler green, legs yellow, head and thorax sometimes brown or orange, mature specimens may be darker brown. Forewing membrane more or less opaque, yellow-brown, veins uniform light brown.

*Adult Description:* Loginova (1972).

#### *Nymph*

*Colour:* 1<sup>st</sup>-2<sup>nd</sup> instars orange, 4<sup>th</sup>-5<sup>th</sup> instars pale green or orange, with or without black tergites. Terminal antennal segment and sometimes sclerites and wing pads darker brown.

*Structure:* Forewing pads and abdomen broadly rounded apically. Antennal segments seven. Tergites extensively reduced on the thorax, typically not extending to the lateral margin on the abdomen. Arolium pad short, broadly expanded apically, usually with a distinct medial groove and short petiole. Circumanal ring broadly crescent-shaped with well rounded anterior lobes, outer ring not contiguous with the apical abdominal margin and with a single row of pores.

*5th instar measurements and ratios:* (specimens 5) BL: 1.73-1.93; BW: 1.15-1.3; WL: 0.7-0.76; CPL: 0.57-0.59; CPW: 0.91-0.93; RW: 0.19-0.23; RL: 0.1-0.11; HW: 0.67-0.71; AL: 0.8-0.88; AL3: 0.22-0.23. WBL: 0.66-0.72; ALHW: 1.19-1.29; ALWL: 1.14-1.22; WLHW: 1.04-1.09; WCPL: 1.54-1.61; CPRW: 4.04-4.79.

*5th instar chaetotaxy:* Head setae simple (max length at anterior margin 0.1-0.15); antennal setae simple; ocular seta simple, inconspicuous (max length 0.02-0.04); primary post-ocular seta typically narrowly or distinctly capitate, sometimes simple (max length 0.05-0.08); secondary post-ocular seta absent or if present, short simple (max length 0.02-0.03). Dorsal thoracic setae short simple (max length 0.02-0.03). Prominent wing pad setae max length 0.05-0.12; forewing and hindwing pads with simple and capitate setae; each wing pad with one prominent apical seta, narrowly or distinctly capitate, hindwing apical seta paired with small simple seta; proximal setae absent; small simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae absent (indistinct small simple), prominent caudal plate setae absent; sectasetae four pairs; marginal abdominal setae (other than sectasetae) three

or four pairs, simple (occasionally slightly capitate, max length 0.18-0.2); pleurite setae paired simple. Legs with or without capitate setae (max length 0.06-0.08); capitate foreleg setae absent; capitate middle and hind leg setae absent or, if present on tibia only, one (distally, often narrow or simple).

*Host plant: Adenocarpus anagyriifolius.*

*Distribution:* Continental: Morocco.

*Notes:* Endemic to the High Atlas where this species and its host plant are locally common.

*Biology:* Clusters of eggs were found inside folded young leaves and under floral bracts or singly on the tips of petiolar bracts, and at the base and tips of young leaflets. Nymphs (1<sup>st</sup>-4<sup>th</sup> instars) were observed on leaf buds or in folded young leaves.

*Comment:* This species is removed from *Arytainilla* (Loginova, 1972) and placed in *Livilla* with the two following species (*L. caprifuga* sp. nov. and *L. baetica* sp. nov.) based on the reduced or absent pterostigma, slender genal cones, shape of the female genitalia and ovipositor, and similarities in paramere form such as thick setae at the base of the posterior margin. Together with *L. caprifuga* sp. nov. and *L. baetica* sp. nov., these species form an exclusively *Adenocarpus*-feeding group, which may also include *L. complexa* sp. nov.

*Material examined:* MOROCCO: 2E, High Atlas, S of Tizi n' Test pass, 30°45'N 8°25'W, c. 2000 m, 19.vi.1998 (DP 236). 12Γ, 13E, as for previous except, c. 2030 m (DP 237). 22Γ, 19E, High Atlas, N of Tizi n' Test pass, 30°52'N 8°22'W, c. 2030 m, 19.vi.1998 (DP 239). 5Γ, 13E, 22 nymphs, High Atlas, just N of Taddert on Tizi n' Tichka rd, 31°20'N 7°25'W, 1650 m, 27.iii.1999 (DP 305). 2Γ, 11E, 2 nymphs, High Atlas, S of Taddert on Tizi n' Tichka rd, 31°18'N 7°25'W, 1650 m, 27.iii.1999 (DP 306). 8Γ, 4E, 13 nymphs, High Atlas, c. 13 km S of Ijoukak, Tizi n' Test rd, 30°50'N 8°28'W, c. 1800 m, 2.v.1999 (DP 328).

***Livilla caprifuga* sp. nov. (15)**

(Fig. 19)

*Adult*

*Colour:* Grey-green to grey-yellow, female abdomens more blue-grey; terminal antennal segments slightly darker brown. Forewing membrane somewhat opaque white, veins uniform yellow or light brown.

*Structure:* Forewing widest in the middle third with more acutely rounded apex; costal break absent (occasionally faint break discernible); pterostigma absent; vein Rs slightly curved in the middle and weakly curved at the apex, towards the costal margin; surface forewing spinules present throughout all cells, distribution non-uniform, very dense: more than 100 per 0.1mm<sup>2</sup>; apical spines in wing cells cu<sub>1</sub>, m<sub>1</sub> and m<sub>2</sub>, but absent from cell r<sub>2</sub>; hindwing costal margin straight. Antennae short, with ten segments; head deflexed downwards with genal cones directed downwards relative to the plane of the vertex; genal cones long, commencing dorsally from more or less the same level as the vertex, terminal setae shorter than the vertex. Distal proboscis segment mid-length. One metatarsal spur. Paramere mid-length, in lateral view slender, simple, with sides tapering towards the apex, sclerotized apex dorsally rounded with a pronounced anteriorly directed hook, in dorsal view contiguous anteriorly, the inner margin rounded with an acute point; paramere longer than the proctiger; proctiger slightly inflated posteriorly towards the base; aedeagus distal segment with a flattened, shallow hook, tip of aedeagus hook blunt; male subgenital plate dorsal profile raised anteriorly. Female proctiger dorsal profile more or less straight from anus to apex, or with slight post-anal depression, apex bluntly rounded; subgenital plate ventral profile shallowly curved, apex acute; ovipositor valvulae ventralis slender, apex acute; height of valvulae dorsalis as great, or greater than valvulae ventralis, dorsally convex, wedge-shaped and tapering to the apex.

*Adult measurements and ratios:* (4 $\Gamma$ , 4E) total length:  $\Gamma$  2.84-3.2, E 3.16-3.4; forewing:  $\Gamma$  length 2.35-2.38 width 0.96-1.03, E length 2.54-2.82 width 1.13-1.24; pterostigma length  $\Gamma$  0.08-0.12, E 0.05-0.15; hindwing length  $\Gamma$  1.93-2, E 2.1-2.4; head width:  $\Gamma$  0.79-0.82, E 0.81-0.93; antennal length: 1.13-1.29; genal cone length: 0.17-0.21; distal proboscis segment length: 0.14-0.17. ALHW: 1.31-1.58; GCVL: 0.68-0.87; WLHW: 2.9-3.22; VLW: 0.45-0.51; WLW: 2.24-2.48; CUR: 1.63-1.93; MR: 0.34-0.51; RMCU: 5.6-9.88; TLFL: 1.11-1.19; TLHW: 0.69-0.74; SCHW: 0.89-0.97; ATIB: 0.26-0.32; MTIB: 0.3-0.33; PBHW: 0.17-0.2; ATMT: 0.86-1.

*Adult genitalia*  $\Gamma$ : MP: 0.3-0.34; PL: 0.42-0.45; AEL: 0.34-0.36; AEH: 0.1-0.12. MPHW: 0.37-0.43; PLHW: 0.53-0.57; MPPL: 0.68-0.76; AEPL: 0.8-0.84; MSLH: 1.17-1.28; AHS: 0.31-0.32; PLSH: 1.25-1.31. E: FP: 0.95-0.98; FSP: 0.56-0.61; RL: 0.24-0.28; OV: 0.21-0.23; EL: 0.31-0.38. FPHW: 1.05-1.17; FPSP: 1.61-1.72; FPCR: 3.5-3.96; OLSP: 0.36-0.4; FEOL: 1.55.

*Nymph* Unknown

*Host plant:* *Adenocarpus bacquei*.

*Distribution:* Continental: Morocco.

*Notes:* The host plant occurs in isolated populations in the eastern High Atlas and Middle Atlas mountains of Morocco. *L. caprifuga* sp. nov. was not common in any of the locations sampled and many of the host plants showed signs of over grazing.

*Biology:* Eggs were found singly on the exterior of leaf buds.

*Etymology:* Named for the threat posed by large groups of grazing goats on the Middle Atlas plains, a likely cause of the host plant's rarity, now restricted to few isolated populations. The epithet is derived from the Latin 'capra' for goat, and 'fugo' to cause to flee.

*Type material:* Holotype  $\Gamma$  (slide mounted), MOROCCO: Middle Atlas, c. 18 km E of Midelt, on rd to Rich, just S of Zebzate, 32°33'N 4°38'W, c. 1500 m, 29.iii.1999 (BMNH). Paratypes 2 $\Gamma$ , 3E, as for holotype (BMNH). 4 $\Gamma$ , 2E, as for holotype (NHMB). 1 $\Gamma$ , 1E, High Atlas, Ait-Toukhsine, Gorges du Dadès, c. 35 km N of Boulmalne-du-Dadès, 31°25'N 6°05'W, c. 1500  $\Gamma$ , 28.iii.1999 (BMNH).

*Other material examined:* MOROCCO: 20 $\Gamma$ , 15E, as for holotype (DP 309). 4 $\Gamma$ , 5E, Middle Atlas, Ait Ou-fella, south of Col du Zad, rd Midelt to Azrou, 32°46'N 5°05'W, c. 1650 m, 29.iii.1999 (DP 310).

***Livilla baetica* sp. nov. (16)**

(Fig. 20)

*Adult*

*Colour:* Brown or dark grey, abdominal intersegment colour yellow, femora and terminal antennal segments darker brown, thorax with darker bands. Forewing membrane with brown pigmentation, veins uniform light or mid-brown.

*Structure:* Forewing widest in the apical third with a broadly rounded apex; costal break and pterostigma present, pterostigma less than one quarter the wing length; vein Rs slightly curved in the middle and not, or only weakly curved at the apex towards the costal margin; surface

forewing spinules present throughout all cells, distribution non-uniform, very dense: more than 100 per 0.1mm<sup>2</sup>; apical spines in wing cells cu<sub>1</sub>, m<sub>1</sub> and m<sub>2</sub> but absent from cell r<sub>2</sub>; hindwing costal margin straight. Antennae short, with ten segments; head deflexed downwards with genal cones directed downwards relative to the plane of the vertex; genal cones long, commencing dorsally from more or less the same level as the vertex, terminal setae as long or longer than the vertex. Distal proboscis segment mid-length. One metatarsal spur. Paramere mid-length, in lateral view with anterior margin curving forward, sides tapering towards the constricted apex, sclerotized apex dorsally flattened with slight anterior projection, in dorsal view contiguous more or less along the entire straight edged, inner margin; paramere shorter than the proctiger; proctiger slightly inflated posteriorly towards the base; aedeagus distal segment with a flattened, shallow hook, tip of aedeagus hook blunt; male subgenital plate dorsal profile raised anteriorly with a distinct step. Female proctiger dorsal profile more or less straight from anus to apex, apex bluntly rounded; subgenital plate ventral profile angled medially, apex acute; ovipositor valvulae ventralis slender, apex acute; height of valvulae dorsalis as great, or greater than valvulae ventralis, dorsally convex, wedge-shaped and tapering to the apex.

*Adult measurements and ratios:* (3Γ, 3E) total length: Γ 3.04-3.2, E 3.36-3.68; forewing: Γ length 2.35-2.58 width 1.02-1.08, E length 2.66-2.84 width 1.1-1.18; pterostigma length Γ 0.35-0.5, E 0.35-0.45; hindwing length Γ 1.85-2.05, E 2.18-2.36; head width: Γ 0.81-0.84, E 0.83-0.88; antennal length: 1.34-1.48; genal cone length: 0.17-0.19; distal proboscis segment length: 0.14-0.15. WLPT: 5.16-7.77; ALHW: 1.52-1.76; GCVL: 0.72-0.76; WLHW: 2.9-3.23; VLW: 0.44-0.48; WLW: 2.3-2.47; CUR: 1.97-2.09; MR: 0.51-0.58; RMCU: 4.82-6.22; TLFL: 1.16-1.26; TLHW: 0.73-0.8; SCHW: 0.9-0.96; ATIB: 0.25-0.3; MTIB: 0.28-0.32; PBHW: 0.16-0.19; ATMT: 0.89-1. *Adult genitalia* Γ: MP: 0.46-0.51; PL: 0.41-0.43; AEL: 0.4-0.42; AEH: 0.14-0.15. MPHW: 0.57-0.61; PLHW: 0.51-0.54; MPPL: 1.09-1.19; AEPL: 0.95-0.98; MSLH: 1.1-1.25; AHS: 0.35-0.36; PLSH: 0.92-1.03. E: FP: 1.05-1.23; FSP: 0.74-0.79; RL: 0.22-0.29; OV: 0.24-0.25; EL: 0.29-0.35. FPHW: 1.27-1.4; FPSP: 1.42-1.56; FPCR: 4.24-4.77; OLSP: 0.32; FEOL: 1.3.

*Nymph* Unknown

*Host plant:* *Adenocarpus decorticans*.

*Distribution:* Continental: Spain.

*Notes:* Occurs sympatrically with *A. montivaga* sp. nov. on the host in the southern Andalusian mountains. It was far less common than the latter species in March, and probably develops later. *L. baetica* sp. nov. was absent from host populations sampled in Morocco.

*Etymology:* Named for the distribution in southern Spain.

*Type material:* Holotype ♂ (slide mounted), SPAIN: Andalusia, N slopes of Sierra de Baza, rd Caniles to Alba, 37°15'N 2°45'W, c. 1600 m, 22.iii.1998 (BMNH). Paratypes 1♂, 2♀, as for holotype (BMNH). 1♂, 2♀, as for holotype (NHMB).

*Other material examined:* SPAIN: 1♂, 1♀, Andalusia, N slopes of Sierra Nevada, rd Calahorra to Puerto de la Ragua, 37°05'N 3°02'W, c. 1850 m, 21.iii.1998 (DP 128). 2♂, 7♀, as for holotype (DP 129).

***Livilla complexa* sp. nov. (17)**

(Fig. 21)

*Adult*

*Colour:* Yellow-orange, femora and terminal antennal segments darker brown, with dark brown bands on the thorax. Forewing membrane coriaceous, yellow-brown becoming darker brown towards the apex and margins, veins uniform yellow or light brown.

*Structure:* Forewing widest in the middle third, with well rounded apex; costal break absent; reduced pterostigma present, less than one quarter the length of the wing; vein Rs more or less straight, not or only weakly curved towards the costal margin at the apex; surface forewing spinules present in all cells but confined to small patches at the margins of cells c+sc and cu<sub>2</sub>, distribution non-uniform, increasingly dense towards the wing margin: more than 100 per 0.1mm<sup>2</sup>; apical spines in wing cells cu<sub>1</sub>, m<sub>1</sub> and m<sub>2</sub>, but absent, or occasionally few present in cell r<sub>2</sub>; hindwing costal margin straight. Antennae short, with ten segments; head deflexed downwards with genal cones directed downwards relative to the plane of the vertex; genal cones long, terminal setae shorter than the vertex. Distal proboscis segment short. One metatarsal spur. Paramere short, in lateral view simple with sides tapering, sclerotized apex dorsally rounded with anteriorly directed hook, in dorsal view contiguous anteriorly; paramere shorter than the proctiger; proctiger not, or only slightly inflated posteriorly towards the base; aedeagus distal segment with a flattened, shallow hook, tip of aedeagus hook blunt; male

subgenital plate dorsal profile more or less straight and horizontal. Female proctiger dorsal profile with a post anal depression, but subsequently straight, apex bluntly rounded; subgenital plate ventral profile shallowly curved, apex acute; ovipositor valvulae ventralis slender, apex acute; height of valvulae dorsalis as great, or greater than valvulae ventralis, dorsally convex, wedge-shaped and tapering to the apex.

*Adult measurements and ratios:* (2 $\Gamma$ , 1E) total length:  $\Gamma$  2.36-2.44, E 2.76-2.88; forewing:  $\Gamma$  length 1.83-1.93 width 0.9-0.94, E length 2.13 width 1.02; pterostigma length  $\Gamma$  0.2-0.3, E 0.15; hindwing length  $\Gamma$  1.53, E 1.76; head width:  $\Gamma$  0.71-0.72, E 0.74; antennal length: 1.13-1.22; genal cone length: 0.15-0.16; distal proboscis segment length: 0.13-0.15. WLPT: 6.43-14.2; ALHW: 1.57-1.72; GCVL: 0.65-0.73; WLHW: 2.54-2.88; VLW: 0.49-0.53; WLW: 2.03-2.09; CUR: 2.16-2.18; MR: 0.49-0.57; RMCU: 6.13-8.08; TLFL: 1.17-1.18; TLHW: 0.78-0.83; SCHW: 0.94-1; ATIB: 0.25-0.27; MTIB: 0.28-0.3; PBHW: 0.18-0.2; ATMT: 0.88.

*Adult genitalia*  $\Gamma$ : MP: 0.31-0.33; PL: 0.29; AEL: 0.27-0.28; AEH: 0.09-0.10. MPHW: 0.43-0.46; PLHW: 0.4-0.41; MPPL: 1.07-1.14; AEPL: 0.93-0.97; MSLH: 1.14-1.22; AHS: 0.34-0.35; PLSH: 1.04-1.07. E: FP: 0.69; FSP: 0.49; RL: 0.23; OV: 0.15; EL: 0.28-0.3. FPHW: 0.93; FPSP: 1.41; FPCR: 3; OLSP: 0.31; FEOL: 1.93.

*Nymph* Unknown

*Host plant:* *Adenocarpus complicatus*.

*Distribution:* Continental: Spain and Portugal.

*Notes:* The host plant is widespread but this species is known from only two locations in northern Andalusia and in central Portugal. Occurring sympatrically with *Arytaina adenocarpi*, it was not common in either of these locations. The host plant affiliation is not certain due to the small number of adults and absence of nymphs. However, the occurrence of *L. complexa* sp. nov. on the same host from two distant locations, combined with the affinities of this species with the other *Adenocarpus*-feeding members of *Livilla* described here, provides evidence for the *Adenocarpus* affiliation.

*Etymology:* Named for the dual taxonomic complexity of both the host plant and the psyllid genus, *Livilla*.



*Comment:* Morphologically this species is closest to the *ulicis*-group, as defined by Hodkinson and Hollis (1987). It is similar to *Livilla vicina* and to the type species of *Livilla*, *L. ulicis*, in the short oval and coriaceous forewing, and in the shape of the head and genal cones.

*Type material:* Holotype ♂ (slide mounted), PORTUGAL: Serra da Estrela, nr Teixeira 40°15'N 7°45'W, c. 1000 m, 27.vi.1998 (BMNH). Paratypes 1♂, 1♀, as for holotype (BMNH).

*Other material examined:* SPAIN: 1♀, Andalusia, c. 7 km E of Aracena, 37°52'N 6°30'W, c. 400 m, 24.vi.1998 (DP 258). PORTUGAL: 3♀, as for holotype (DP 262.3).

Genus *Pseudacanthopsylla* Samy

*Pseudacanthopsylla* Samy, 1972: 455

Type species *Pseudacanthopsylla retamae* Samy, 1972: 455

*Pseudacanthopsylla improvisa* (Loginova) **comb. nov.**

(Figs 23D & 30B)

*Psylla improvisa* Loginova, 1972: 30

*Adult Colour:* Yellow-grey; forewing membrane clear or faintly yellow, veins uniformly pale.

*Adult Description:* Loginova (1972).

*Nymph*

*Colour:* Grey-green or more red; terminal antennal segment darker.

*Structure:* Forewing pads and abdomen acute apically. Antennal segments seven. Tergites extensively reduced on the thorax, typically not extending to the lateral margin on the abdomen. Arolium pad short, narrowly triangular, without medial groove and with a short petiole. Circumanal ring shape narrowly crescent-shaped with acutely rounded anterior lobes, outer ring not contiguous with the apical abdominal margin and with a single row of pores.

*5th instar measurements and ratios:* (specimens 3) BL: 1.43-1.78; BW: 1.03-1.11; WL: 0.59-0.62; CPL: 0.45-0.46; CPW: 0.63-0.65; RW: 0.11-0.12; RL: 0.07; HW: 0.61-0.7; AL: 0.48-0.52; AL3: 0.11-0.12. WBL: 0.62-0.72; ALHW: 0.74-0.79; ALWL: 0.79-0.88; WLHW: 0.88-1; WCPL: 1.39-1.44; CPRW: 5.42-5.82.

*5th instar chaetotaxy:* Head with numerous sectasetae (few simple setae ventrally) (max length at anterior margin 0.03-0.04); antennae with two or more sectasetae on each segment; eyes with several small sectasetae dorsally (max length 0.02-0.03); primary post-ocular seta indistinct (of the numerous sectasetae, one in the equivalent position appears slightly larger); secondary post-ocular seta absent (indistinct from surrounding setae). Dorsal thorax with sectasetae (max length 0.03-0.04). Prominent wing pad setae max length 0.04; forewing and hindwing pads with numerous sectasetae, surface and marginal, proximal setae indistinct from surface setae. Dorsal abdominal pre-caudal tergites and caudal plate with numerous sectasetae, including one larger positioned centrally and posteriorly; marginal abdominal sectasetae numerous; marginal abdominal setae (other than sectasetae) absent; pleurite setae paired simple. All legs with sectasetae present ventrally, on femora, tibiae and tarsi (max length 0.04).

*Host plant:* *Retama raetam*.

*Distribution:* Continental: Morocco.

*Notes:* This species occurs on populations of the host plant along the southern Atlantic coast of Morocco. It is found sympatrically with *Arytainilla sulci* and *Livilla retamae*, but it is less common than either of these species which also occur on inland host populations. The egg is particularly slender with a stout lateral pedicel at the base. Sculpturing is evident on the dorsal surface between the vitelline membrane and the egg shell in the chorion layer, implying a respiratory or insulatory function for this feature (Fig. 30B).

*Comment:* This species is transferred to *Pseudacanthopsylla* from *Psylla* (Loginova, 1972) based on the similarity in the form of both adult and nymph to *Pseudacanthopsylla retamae*. The nymphal form is uniquely peculiar within the Arytaininae. *P. retamae* is the only other congeneric species and occurs on populations of the same host plant in the eastern Mediterranean (Samy, 1972; Al-Khawaldeh, Katbeth-Bader & Burckhardt, 1997).

*Material examined:* MOROCCO: 4♂, 1E, Southern Atlantic coast, E side of Agadir, 30°25'N 9°30'W, s.l., 19.vi.1998 (DP 234). 16♂, 10E, as for previous except, 23.iii.1999 (DP 301). 11♂, 12E, 7 nymphs, as for previous except, 29.iv.1999 (DP 321). 14♂, 9E, Atlantic Coast, c. 15 km S of El Jadid, 32°55'N 8°35'W, c. 100 m, 21.iii.1999 (DP 297).

#### 2.3.4 SUBFAMILY ACIZZIINAE

Genus *Acizzia* Heslop-Harrison*Neopsylla* Heslop-Harrison, 1949: 161*Acizzia* Heslop-Harrison, 1961a: 417Type species *Psylla acaciae* Maskell, 1894, by original designation*Acizzia uncatoides* (Ferris & Klyver)

(Figs 1D &amp; 29D)

*Psylla uncatoides* Ferris & Klyver, 1932: 53*Acizzia uncatoides* (Ferris & Klyver) Loginova, 1977: 577

*Adult Colour:* Orange-brown, sometimes with paler light green or yellow abdomens. Forewing membrane pale yellow with a pattern of orange or light brown clouds and spots in the apical portion and towards the margins, veins yellow or light brown.

*Adult Description:* Hodkinson & Hollis (1987).

*Nymph*

*Colour:* 1<sup>st</sup>-2<sup>nd</sup> instars cream and orange, 3<sup>rd</sup>-5<sup>th</sup> instars orange-brown with black tergites.

Sclerites, wing pads, legs and terminal antennal segments darker brown.

*Structure:* Forewing pads and abdomen broadly rounded apically. Antennal segments nine. Tergites reduced on the thorax (though not as extensively as in other genera), typically not extending to the lateral margin on the abdomen. Arolium pad short, expanded apically with or without slight medial groove, and with a long petiole; circumanal ring broadly crescent-shaped with well rounded anterior lobes, outer ring not contiguous with the apical abdominal margin and with a single row of pores.

*5<sup>th</sup> instar measurements and ratios:* (specimens 4) BL: 1.13-1.28; BW: 0.86-0.94; WL: 0.48-0.49; CPL: 0.3-0.31; CPW: 0.55-0.6; RW: 0.1-0.11; RL: 0.06; HW: 0.52-0.58; AL: 0.52-0.54; AL3: 0.1-0.11. WBL: 0.73-0.77; ALHW: 0.9-1.02; ALWL: 1.06-1.13; WLHW: 0.83-0.94; WCPL: 1.83-2; CPRW: 5.18-6.

*5th instar chaetotaxy:* Head setae simple and distinctly capitate (capitate setae on the anterior margin, and short simple and longer capitate setae dorsally) (max length at anterior margin 0.07-0.08); antennal setae simple and capitate (capitate distally on 3<sup>rd</sup> and 5<sup>th</sup> segments); ocular seta capitate, dark, conspicuous (max length 0.05-0.06); primary post-ocular seta distinctly capitate (max length 0.06); secondary post-ocular seta indistinct (small simple). Dorsal thoracic

setae short simple and long capitate (max length 0.07). Prominent wing pad setae max length 0.08-0.09; forewing and hindwing pads with capitate setae only; forewing pad prominent setae 13-16, distinctly capitate, surface and marginal (10-12 marginal, 3-4 surface); hindwing pad prominent setae 8, distinctly capitate, surface and marginal (2 apical, 2 marginal,  $\pm$  4 surface); proximal setae distinctly capitate; small rod or simple setae scattered on the wing pad surfaces. Dorsal abdominal prominent pre-caudal setae present on all tergites, long capitate (max length 0.08), prominent caudal plate setae present,  $\pm$  21 (1 positioned centrally and posteriorly), distinctly capitate; sectasetae absent; marginal abdominal setae (other than sectasetae) four or more pairs, distinctly capitate (max length 0.09-0.1); pleurite setae paired simple or capitate (on anterior pleurites). Legs with capitate setae present (max length 0.06-0.07); capitate foreleg setae present on tibia only, 3-4; capitate middle and hind leg setae present on femur and tibia, on the tibia 4-7.

*Host plant:* *Acacia* spp.

*Distribution:* Canary Islands and Continental (introduced from Australia).

*Notes:* Recorded from Tenerife and La Palma, this introduced species is abundant on cultivated *Acacia* spp. and is likely to be present on all islands where the host has been introduced.

*Biology:* Nymphs were observed in inflorescences and on peduncles.

*Material examined:* CANARY ISLANDS. TENERIFE: 3 $\Gamma$ , 3E, La Laguna University, 18.vii.1997 (DP 87). LA PALMA: 50 $\Gamma$ , 50E, 20 nymphs, Barranco de las Angustias, 28°40'15"N 17°55'30"W, c. 300 m, 18.v.1998 (DP 194).

## 2.4 General notes on biology

All eggs examined with the exception of those of *Pseudacanthopsylla*, were smooth surfaced (Fig. 30A) and generally pale cream or yellow with an orange base and, in later development, black antennal spots and red eye spots were visible. The basal pedicel is frequently small but is more well developed in some species (Fig. 31B). Little variation in egg type was found. However, in the species comprising *Arytainilla sensu stricto* which are characterized by a massive ovipositor, the eggs are generally smaller and more slender. The dorsal part of the eggs

of *Pseudacanthopsylla improvisa* are covered with a hexagonal sculpturing and the eggs are markedly elongate (Fig. 30B).

Parasitized 5<sup>th</sup> instar nymphs of three species *A. proboscidea*, *A. occidentalis* sp. nov. and *Livilla monospermae* were collected in the field and kept until parasitoids emerged after one to two weeks. All parasitoids were identified as Encyrtidae from the genera *Prionomitus*, *Pachyneuron* and *Trechnites* (J. Noyes pers. comm.). Mites were also common parasites and were found on a number of Macaronesian and continental species.

Mating between psyllids was frequently observed in the pooter and further observations were made in the laboratory. In all cases males were much more active than females. In field collections where more than one species was collected into the same vial (typically species that share the same host plant), mating was common but interspecific mating activity was never observed and only rarely was a male seen to approach a female of a different species.

## 2.5 Discussion

Among the Gensiteae-feeding species members of *Arytainilla* and *Arytaina* feed predominantly on host plants in the *Cytisus* group, while members of *Livilla* and *Arytinnis* gen. nov. feed predominantly on hosts in the *Genista* group. However, all genera include species feeding on *Cytisus*, *Genista* and *Adenocarpus* groups (Table 1). This implies that there are some constraints on host preference but that within these four genera switching between host groups does occur. It is sometimes difficult to assess from historical records whether single species feed on more than one host group, since identification of hosts, when present, is often doubtful or ambiguous. During this study only one species, *Arytinnis modica*, was found to feed sympatrically on ‘unrelated’ hosts, i.e. hosts from both *Cytisus* and *Genista* groups.

The diversity of *Arytinnis* gen. nov. in the Canary Islands is extraordinarily high for such a small area when compared to the continent. Much of this diversity appears to be linked to host plant diversity in the genus *Teline*. Speciation in other legume-feeding genera represented in the Canary Islands may therefore be constrained by the level of diversification undergone in the host genus. For instance, the host genus *Retama* is represented by a single widespread species which is host to a single psyllid species. The two host genera *Adenocarpus* and *Spartocytisus*

are each represented by two ecologically specialized species, with each pair hosting two closely related psyllid species; and on Madeira there is one member of *Genista* and one member of *Teline*, each host to a single psyllid species. In these instances the one-to-one pattern suggests a possible history of parallel diversification in host and psyllid. However, the pattern is increasingly complex in the *Teline*-feeding group, where host sharing and switching may have been facilitated by host hybridization. Asynchronicity of development in species sharing the same host plant and close tracking of host plant phenology may partly explain the complex patterns of host associations. There is some evidence that abundance of psyllid species may be affected by fragmentation of habitat and host plant populations as well as by the cultivation of native legumes for fodder crops. In particular, the cultivation of ‘tagasaste’ (*Chamaecytisus proliferus* ssp. *proliferus* var. *palmensis*) could account for the high densities of psyllids associated with this host, on both cultivated and natural populations of ‘tagasaste’ as well as on other intraspecific taxa.

More than a quarter of the new species described were collected from continental hosts in the genus *Adenocarpus*, but only a little over half the species in this genus were sampled. With several species endemic to montane regions in north Africa, in addition to being the only genus in the Genisteae with a distribution extending into tropical Africa (*A. mannii* is found in montane regions from Nigeria to Malawi and Angola), further extensive sampling of this host genus may reveal additional species that would contribute to the understanding of the phylogenetics of the Axyrtaininae, in particular the genus *Livilla sensu lato*.

## 2.6 References

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