

Legume-feeding psyllids (Hemiptera, Psylloidea) of the Canary Islands and Madeira

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(Accepted 20 June 2001)

A detailed survey of the jumping plant-lice, or psyllids (subfamily Aryaninae) that feed on genistoid legumes in the Canary Islands and Madeira revealed a high level of endemism and diversification in this region. The taxonomy of the genus *Arytainilla* is reappraised 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* which is represented in the Canary Islands by a single species. One new genus and 11 new species are described. Descriptions of previously undescribed 5th instar nymphal stages for 24 species are included. Nine of the new species (eight from the Canary Islands and one from Morocco) are described in *Arytainis* gen. n., two more species from the Canary Islands are described in *Arytainilla* and *Arytaina*. In addition, 12 new combinations are proposed. 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 *Arytainis* gen. n. and the remaining Canary Island species.

KEYWORDS: taxonomy, jumping plant-lice, phytophagous insects, host plant specificity, Leguminosae, Genisteae, Macaronesia, Mediterranean, Morocco.

Introduction

The psyllid subfamily Aryaninae (Psyllidae) has around 14 genera, but generic inclusion has varied (Heslop-Harrison, 1951, 1961a; Loginova, 1978; Hodkinson and Hollis, 1987). Five of these genera feed exclusively on genistoid legumes (Genisteae, 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 reappraisal of *Arytainilla sensu* Loginova, 1972. The predominantly Macaronesian species are here placed in a separate genus,

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Arytinnis gen. n., 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. gredi*, *A. ima* and *A. sulci* in this genus is problematic, nevertheless it seems best to retain these species in *Arytainilla* until further work resolves their placement within Arytaininae.

Although none of the five genera of legume-feeding psyllids represented in the Canary Islands and Madeira are endemic, all 23 species in the four Arytaininae genera, *Arytaina*, *Arytainilla*, *Arytinnis* gen. n. and *Livilla* are endemic, while a single *Acizzia* (Acizziinae) species is introduced. There are 21 species in *Arytinnis* gen. n., 16 of which are endemic to the Canary Islands and half of these are newly described species. 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. The predominantly continental genera—*Livilla* and *Arytainilla*—are each represented by a single species in the Canary Islands.

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 emphasize 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 (5th instar) nymphal stage for *Arytinnis* gen. n. have been limited to one species (*A. hakani*, Rapisarda, 1987). With the addition here of a further 19 descriptions of 5th instar nymphs, only one species (*A. canariensis*) remains with the nymph unknown. The general homogeneity in adult and nymphal morphology of the Macaronesian and continental species in *Arytinnis* gen. n. suggests that this group may have arisen and diversified relatively recently. In contrast, the differences in adult and nymphal morphology are pronounced in the remaining *Arytainilla* species. This heterogeneity could indicate a greater age for this lineage with the greater possibility of extinct intermediates.

All native legume-feeding psyllids in the Canary Islands feed on hosts in the tribe Genisteae (Papilionoideae, Leguminosae). These papilionoid legume shrubs include the common brooms and gorse, which 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, 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 and Dingwall, 1972; Talavera and Gibbs, 1999). The extensive ecological radiation of this group in the Canary Islands contrasts with other genistoid genera present in the Canaries: *Chamaecytisus*, *Genista* and *Retama* 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 and 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 (table 1).

Although some members of *Arytinnis* gen. n. 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 (tables 1, 2). In the Canary Islands there has been considerable diversification of the *Teline*-feeding psyllids that reflects the diversification in the host genus.

Materials, methods and terminology

Field collections were made during June to July and December 1997, March to July 1998, March to May 1999 and July to 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 1st and 2nd instar nymphs. Identifications were made from alcohol, slide mounted (method in Hodkinson and 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. Pressed plant specimens (deposited at Glasgow University Herbarium (GL) and Royal Botanic Garden Edinburgh (E)) were made of all host plants including infraspecific taxa for confirmation of host identification. Presence of adults and nymphal instars was used to assess host specificity. 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 figures 1 and 2 and the treatment of setal placement in nymphal descriptions and keys is indicated in figure 1. All other terminology and measurements follow Hodkinson and White (1979) and White and Hodkinson (1982, 1985). 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); Zoological Museum of Helsinki (ZMH). Other material is in the collection of the author indicated by DP and a collection number.

Abbreviations used in the descriptions are as follows (all measurements are recorded in mm): Adults: WL, wing length; HW, head width; AL, antennal length; GC, genal cone length; PB, distal proboscis segment length; WLPT, ratio forewing length: pterostigma length; GCVL, ratio genal cone length: vertex length; 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; TLFL, ratio hind leg tibia length: femur length.

Adult genitalia ♂: MP, proctiger length; PL, paramere length; AEL, distal aedeagus segment 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 ♀: FP, proctiger length; FSP, subgenital plate length; RL, anal ring length; OV, ovipositor valvulae dorsalis length; EL, egg length.

Nymphs: BL, body length; BW, body width; WL, forewing pad length; CPL, caudal plate length; CPW, caudal plate width; RW, circumanal ring width; HW, head width; AL, antennal length.

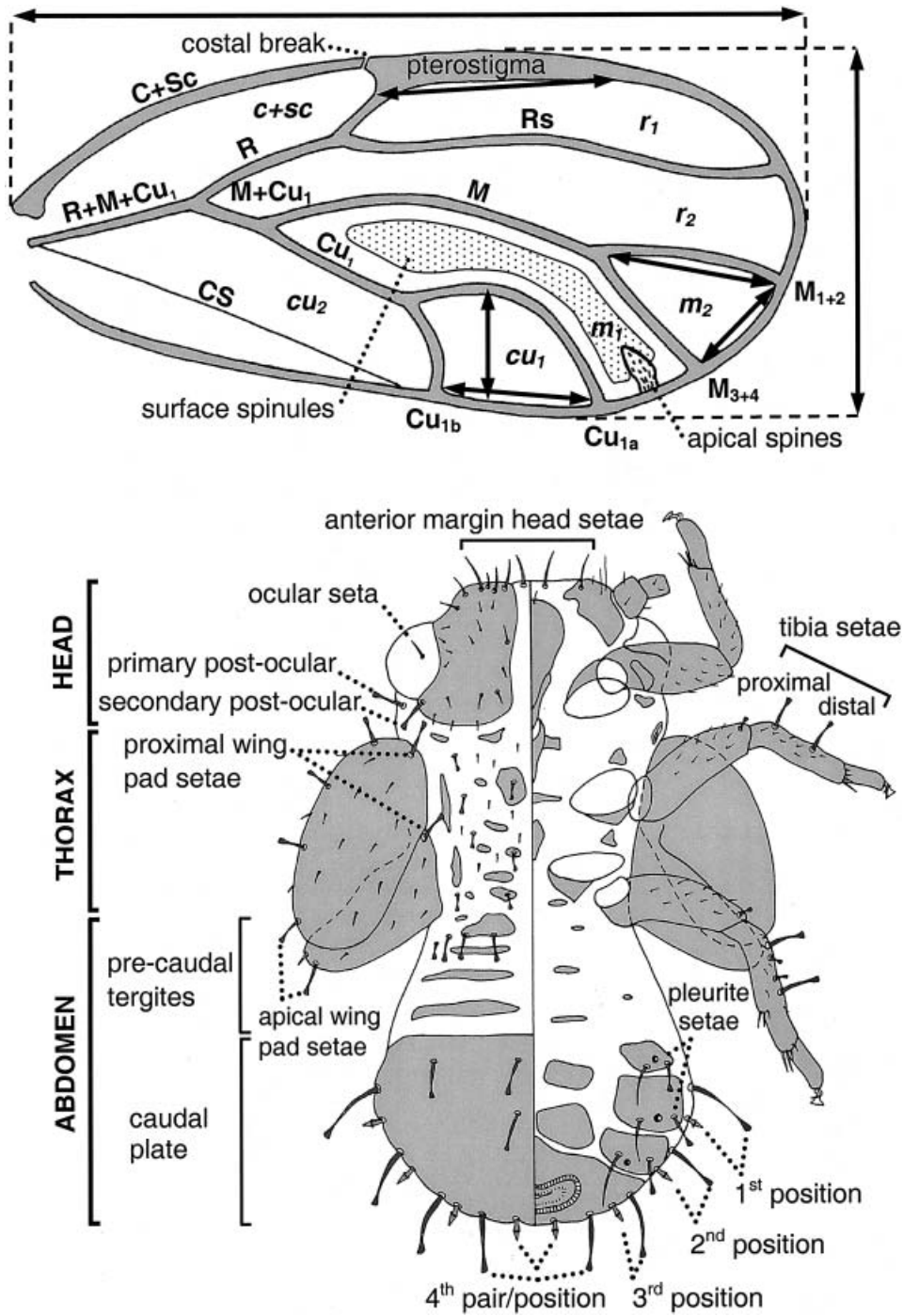


FIG. 1. Guide to measurements, terminology and nymphal chaetotaxy; adult forewing (above) and 5th instar nymph (below). Fifth instar nymphs can be distinguished from the preceding four instars by the number of antennal segments and the differentiation of the tibia and tarsal segments.

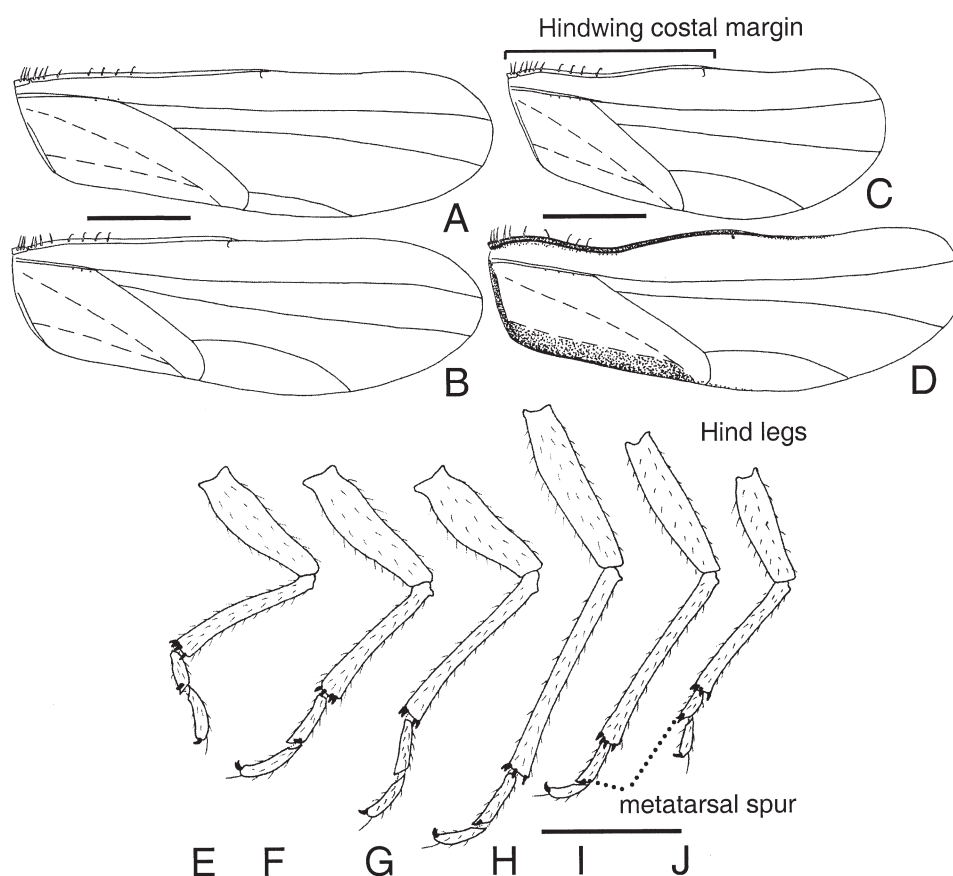


FIG. 2. Examples of variation in adult hindwings and hind legs. (A) *Livilla monospermae*; (B) *Arytainilla serpentina* sp. n.; (C) *Arytinnis nigrilineata*; (D) *Arytaina vittata* sp. n.; (E) *Arytainilla serpentina* sp. n.; (F) *Arytaina vittata* sp. n.; (G) *Livilla monospermae*; (H) *Arytinnis nigrilineata*; (I) *A. canariensis* sp. n.; (J) *A. romeria* sp. n. Scale bars = 0.5 mm.

Systematics

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; distal aedeagus segment 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; female genitalia truncated, proctiger (< 0.5 mm) shorter than $0.7 \times$ head width, circumanal ring relatively long—proctiger length less than $2.6 \times$ ring length *Acizzia* Heslop-Harrison [a single introduced species, *Acizzia uncatoides* (Ferris and 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; distal aedeagus segment either straight or curved, apex with a hook or bluntly rounded; male proctiger either not, or only gradually becoming inflated posteriorly towards the base; female genitalia longer,

- proctiger (>0.5 mm) greater than $0.7 \times$ head width, circumanal ring relatively short—
 proctiger length greater than $2.6 \times$ ring length 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 ($MR > 0.8$); 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 (figure 2G) *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 one-quarter 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 ($MR < 0.7$); 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 (figures 2E, F, H–J) 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 $0.75 \times$ vertex length; male paramere long and sinuous, length $\geq 0.9 \times$ head width; distal aedeagus segment long (>0.45 mm), apex small 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 $0.5 \times$ subgenital plate length (figures 2B, 3) *Arytainilla* Loginova [a single species, *Arytainilla serpentina* sp. n., 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 $0.75 \times$ vertex length; male paramere shorter than $0.9 \times$ head width; distal aedeagus segment shorter (<0.45 mm), apex with a relatively large 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 $0.5 \times$ subgenital plate length (figures 2C, D) 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; male paramere shorter than the proctiger, length $<0.4 \times$ head width *Arytaina* Foerster
- Body colour predominantly green (mature adults sometimes develop brown coloration); forewing with costal break and long pterostigma; head deflexed downwards; male paramere longer than the proctiger, length $\geq 0.4 \times$ head width *Arytainis* gen. n.

Key to 5th 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 third and fifth segments; anterior head and ocular setae distinctly capitate; total body length less than 1.5 mm; antennae shorter (<0.7 mm) than $1.5 \times$ forewing pad length, or $1.2 \times$ head width; width of caudal plate greater than $1.7 \times$ length, and greater than $5 \times$ anal ring width *Acizzia* Heslop-Harrison [a single introduced species, *Acizzia uncatoides* (Ferris and 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 (>0.7 mm) than $1.5 \times$ forewing pad length, or $1.2 \times$ head width; width of caudal plate less than $1.7 \times$ length, and less than $5 \times$ anal ring width (figure 22B–D) *Arytaina* Foerster

- 3 Distinctly capitate setae present on anterior margin of the head, and distally on third and fifth antennal segments; numerous small, pale, capitate setae present dorsally on the wing pad surfaces and thorax (figure 22A) *Livilla* Curtis [a single species, *Livilla monospermae* Hodkinson, on *Retama monosperma*]
- 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; head width less than forewing pad length; caudal plate length (>0.8 mm) greater than width (figure 18D) *Arytainilla* Loginova [a single species, *Arytainilla serpentina* sp. n., 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 macrosetae; antennae longer than forewing pad length; head width as great or greater than forewing pad length; caudal plate length (<0.6 mm) less than width (figures 17-21) *Arytinnis* gen. n.

ARYTAININAE

Arytainilla Loginova

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

Lindbergia Heslop-Harrison, 1951: figures 2a, 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.

Comment. This is a heterogeneous group of 10 species. With the removal of the Macaronesian-centred group into *Arytinnis* gen. n., *Arytainilla sensu stricto* is considered to be a monophyletic group of seven species that can be distinguished most notably by the large female genitalia and robust ovipositor. Three residual species, *A. gredi*, *A. ima* and *A. sulci* 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. *Arytainilla* is predominantly a continental genus with only one species occurring in the Canary Islands. Useful biological notes for species occurring in Italy can be found in Conci *et al.* (1993, 1996).

Arytainilla sensu stricto

Arytainilla algeriensis Burckhardt

Arytainilla barbagalloi Rapisarda

Arytainilla cytisi (Puton)

Arytainilla delarbrei (Puton)

Arytainilla serpentina sp. n.

Arytainilla spartiicola (Šulc)

Arytainilla spartiophila (Foerster)

Arytainilla residual species

Arytainilla gredi (Ramírez Gómez)

Arytainilla ima Loginova

Arytainilla sulci (Vondráček)

Arytainilla serpentina sp. n.
(figures 2B, 2E, 3, 18D)

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_1 and m_2 relatively broad and low and cell r_1 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 $c+sc$, dense: 60–100 per 0.1 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 10 segments; genital cones long, terminal setae shorter than the vertex. Male genitalia as in figure 3F–I; in dorsal view, paramere apex contiguous anteriorly and rounded with an acute point; aedeagus distal segment bluntly rounded, not developed into a hook. Female genitalia as in figure 3E; proctiger apex is darkly pigmented and arched with an upturned tip; subgenital plate ventral profile angled medially; ovipositor large and robust. Egg slender with stout pedicel at the base.

Adult measurements and ratios. (3♂, 4♀) total length: ♂ 3.24–3.56, ♀ 3.64–3.88; WL: ♂ 2.6–2.7, ♀ 2.96–3.19; HW: ♂ 0.76–0.8, ♀ 0.8–0.85; AL: 1.3–1.53; GC: 0.18–0.2; PB: 0.09–0.1. WLPT: 3.7–4.79; GCVL: 0.78–0.91; VLW: 0.43–0.49; WLW: 2.71–2.93; CUR: 2.33–2.71; MR: 0.47–0.69; TLFL: 1.02–1.09. Adult genitalia ♂: MP: 0.56–0.66; PL: 0.72–0.74; AEL: 0.5–0.51; MSLH: 1.24–1.27; AHS: 0.13; PLSH: 1.74–1.76. ♀: FP: 1.13–1.28; FSP: 0.96–0.99; RL: 0.23–0.25; OV: 0.54; EL: 0.2–0.28.

Nymph

Colour. Fifth instars bright green with thorax and head more yellow, wing pads and ventral abdomen pale orange; terminal antennal segments darker brown.

Fifth instar 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.

Fifth instar measurements. (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; HW: 0.72–0.76; AL: 0.65–0.69.

Fifth instar chaetotaxy. Head and antennal setae simple; ocular seta small simple; primary post-ocular seta simple or slightly spathulate; secondary post-ocular seta indistinct. Dorsal thoracic setae very short simple. Wing pads without macrosetae, forewing and hindwing pads with minute simple setae only. Dorsal abdominal pre-caudal and caudal plate without macrosetae (only simple microsetae); sectasetae three pairs; marginal abdominal setae (other than sectasetae) two pairs, simple, or slightly spathulate; pleurite setae paired simple. Legs with simple setae only.

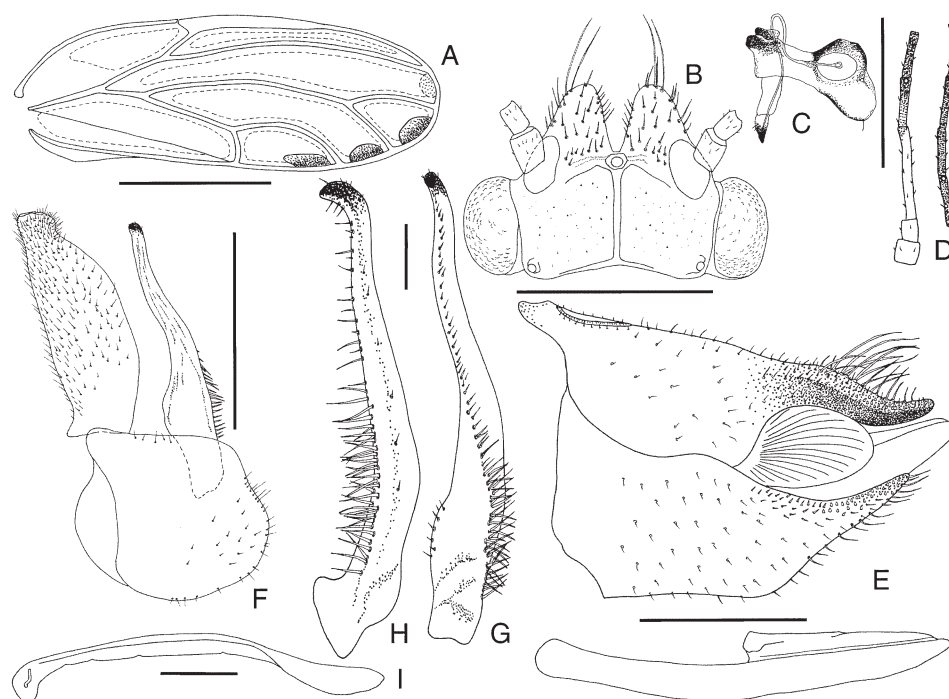


FIG. 3. Adult *Arytainilla serpentina* sp. n. (A) forewing; (B) head; (C) proboscis and clypeus; (D) antenna; (E) ♀ genitalia and ovipositor; (F) ♂ genitalia; (G) ♂ paramere interior view; (H) ♂ paramere posterior view; (I) ♂ aedeagus. Scale bars: A=1 mm, B-F = 0.5 mm, G-I = 0.1 mm.

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. n., 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. n.

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: rd El Granel to Barlovento and Roque Faro, 200–500 m, 19 May 1998 (BMNH). Paratypes 11♂, 8♀, 4 nymphs, as for holotype (BMNH). 1♂, 1♀, nr Los Galguitos, Barranco de la Fuente, 28°46'N, 17°46'W, 350 m, 17 May 1998 (DZUL). 9♂, 3♀, as for previous (NHMB).

Arytinnis gen. n.

Arytainilla Loginova, 1972: 17, in part; 1977: 64, in part; Hodkinson and Hollis, 1987: 41, in part. Type species: *Arytainilla pileolata* Loginova, 1976: 26; here designated.

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_1 and m_2 relatively high; costal margin of the hindwing slightly concave. Antennae with 10 segments. Head deflexed downwards; genal cones short, 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. Profile of female proctiger variable, apex bluntly rounded; subgenital plate shallowly curved or with a medial bulge, apex acute; ovipositor valvulae ventralis slender, 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; macrosetae 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 with simple setae. Eyes with a single ocular seta positioned towards the inner margin. Wing pads with macrosetae present, either capitate or simple. Abdomen with three to four pairs of marginal sectasetae. 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 5th instar nymphs have long antennae and three or more pairs of sectasetae. 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 different hosts that grow in close association (in the latter case, transient adults may be found on non-host plants).

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 (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 (on *Adenocarpus foliolosus*; Gran Canaria, Tenerife, La Gomera) *nigralineata* (Loginova)
- 3 Males and females with strikingly large genitalia, female proctiger longer than $1.2 \times$ head width; male paramere longer (>0.5 mm) than $0.7 \times$ head width 4
- Male and female genitalia smaller, female proctiger shorter than $1.2 \times$ head width, male paramere shorter (≤ 0.5 mm) than $0.7 \times$ 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; tip of aedeagus hook not, or only slightly upturned; surface forewing spinules dense (60–100 per 0.1 mm^2) (on *Teline stenopetala*; Tenerife) (figure 7) *menceyata* sp. n.
- 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, and positioned to the interior and posterior of the top of the paramere; tip of aedeagus hook markedly upturned; surface forewing spinules sparse (less than 40 per 0.1 mm^2) 5
- 5 Larger species: (total length ♂ 2.96–3.72, ♀ 3–4.04) antennae longer than 1.5 mm; forewing longer than 2.4 mm; female proctiger longer than 1 mm; male paramere (in lateral view) either with a sloping anterior shoulder 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, and with the apex (in dorsal view) not or only weakly curved 6
- Smaller species: (total length ♂ 2.6–2.84, ♀ 2.76–3.16) antennae shorter than 1.5 mm; forewing shorter than 2.4 mm; female proctiger shorter than 1 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) (figures 12, 13C, D) *hupalupa* sp. n.
- 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 *Chamaecytisus*; Gran Canaria, Tenerife, La Gomera) (figure 13E, 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 *Chamaecytisus* and *Teline stenopetala*; La Palma, El Hierro) (figure 13A, 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 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 positioned either to the interior or posterior of the top of the paramere 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 (≥ 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 ≤ 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 ≥ 0.85 mm (on *Teline maderensis*; Madeira) *incuba* (Loginova)
- 11 Male paramere length $\leq 1.25 \times$ 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 ≥ 0.72 mm 12
- Male paramere length $> 1.25 \times$ subgenital plate height, sclerotized apex (in lateral view) with small anterior projection, and (in dorsal view) contiguous anteriorly or contiguous along inner margin; male proctiger length $\leq 0.75 \times$ paramere length; head width ≤ 0.72 mm 13
- 12 Genal cones very short (<0.09 mm), less than $0.5 \times$ length of the vertex with the terminal setae darkly pigmented; distal proboscis segment long (≥ 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; hind leg tibia long, more than $0.9 \times$ head width, metatarsus longer than apical tarsus (on *Teline canariensis*; Tenerife) (figures 2I, 6) *canariensis* sp. n.
- Genal cones longer (>0.09 mm), equal to or greater than $0.5 \times$ 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; hind leg tibia relatively short, less than $0.9 \times$ 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 mm^2); male paramere shorter (<0.35 mm) than $0.55 \times$ head width, or $1.4 \times$ subgenital plate height; male proctiger shorter (<0.24 mm) than $0.35 \times$ head width (on *Genista segonnei*; Morocco) (figure 14) *berber* sp. n.
- Female proctiger length greater than head width; surface forewing spinules relatively dense (40–60 per 0.1 mm^2); male paramere longer (>0.35 mm) than $0.55 \times$ head width, or $1.4 \times$ subgenital plate height; male proctiger longer (>0.24 mm) than $0.35 \times$ head width (on *Teline osyroides*; Tenerife) (figure 8) *ochrita* sp. n.
- 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 positioned 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 mm^2); male paramere short and broad, length (<0.35 mm) equal to, or less than the height of the subgenital plate; female proctiger shorter than $1.4 \times$ 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 0.1 mm²); male paramere long and slender, length (>0.35 mm) greater than the height of the subgenital plate; female proctiger length $\geq 1.4 \times$ 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 $1.4 \times$ height of subgenital plate, in lateral view apex not bent forwards, and with three or four stout setae at the top of the terminal blade, the sclerotized apex more or less triangular; sclerotized portion (in dorsal view) contiguous anteriorly; aedeagus hook tip turning upwards; female proctiger dorsal profile with a post-anal depression; female subgenital plate without pointed projections on the dorsal margins (on *Teline*; Gran Canaria, Tenerife) (figure 10A) *diluta* (Loginova)
- Genal cone terminal setae pale; male paramere shorter than $1.4 \times$ height of subgenital plate, in lateral view curving forwards at the apex, the terminal blade and sclerotized apex with anterior projections; sclerotized portion (in dorsal view) contiguous posteriorly; aedeagus hook tip not upturned; female proctiger dorsal profile more or less straight; female subgenital plate with pointed projections on the dorsal margins (on *Teline microphylla*; Gran Canaria) (figure 10B) *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 (on *Teline stenopetala*; La Gomera) (figure 11) *gomeræ* sp. n.
- 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 18
- 18 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 (on *Teline stenopetala*; La Palma, El Hierro) (figures 9, 10C) *occidentalis* sp. n.
- 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 flattened, shallow hook 19
- 19 Male paramere longer than $1.3 \times$ height of subgenital plate, sclerotized apex (in dorsal view) contiguous along inner margin; male proctiger $\geq 0.4 \times$ head width; female proctiger length greater than the head width, with the circumanal ring shorter than $0.25 \times$ proctiger length (on *Teline microphylla*; Gran Canaria) *prognata* (Loginova)
- Male paramere shorter than $1.3 \times$ height of subgenital plate, sclerotized apex (in dorsal view) contiguous anteriorly; male proctiger shorter than $0.4 \times$ head width; female proctiger length less than the head width, with the circumanal ring longer than $0.25 \times$ proctiger length 20
- 20 Antennae longer than 1.5 mm, equal to, or greater than $2 \times$ 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; hind leg tibia longer than $0.7 \times$ head width (on *Teline splendens*; La Palma) (figures 5, 10D) *fortunata* sp. n.
- Antennae shorter than 1.3 mm, about $1.5 \times$ 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 $0.7 \times$ head width (on *Teline rosmarinifolia*; Gran Canaria) (figures 2J, 4) *romeria* sp. n.

Key to 5th 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 figure 1 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 macrosetae; marginal abdominal setae (other than sectasetae) simple or narrowly capitate (on *Adenocarpus*; Tenerife, La Palma) (figure 17D) *proboscidea* (Loginova)
- Forewing and hindwing pads with simple and capitate setae; dorsal caudal plate with four macrosetae; marginal abdominal setae (other than sectasetae) distinctly capitate (on *Adenocarpus foliolosus*; Gran Canaria, Tenerife, La Gomera) (figure 17C) *nigralineata* (Loginova)

- 3 Antennae shorter than 1 mm, less than $1.5 \times$ 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 capitate macrosetae (apical and proximal) (on *Teline stenopetala*; La Gomera) (figure 19A) *gomeræ* sp. n.
- Antennae longer than 1 mm, greater than $1.5 \times$ 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 capitate macroseta (apical) (on *Teline stenopetala*; La Palma, El Hierro) (figure 19B) *occidentalis* sp. n.

- 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 apical macroseta, proximal setae indistinct; antennae shorter than 0.8 mm, less than $1.3 \times$ head width, or $1.68 \times$ 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) (figure 20D) *ochrita* sp. n.
- Wing pads each with two macrosetae—apical and proximal; antennae longer than 0.8 mm, $\geq 1.3 \times$ head width, and greater than $1.68 \times$ 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) (figure 20C) *dividens* (Loginova)

- 7 Forewing pad macrosetae two (apical and proximal) (on *Teline microphylla*; Gran Canaria) (figure 19D). *equitans* (Loginova)
- Forewing pad macrosetae more than five 8

- 8 Antennae typically longer, greater than $1.95 \times$ forewing pad length; secondary post-ocular and dorsal thoracic macrosetae longer (maximum length greater than 0.1 mm), capitate (minute simple only); ocular seta long and conspicuous (on *Teline maderensis*; Madeira) (figure 21C) *incuba* (Loginova)
- Antennae typically shorter, less than $1.95 \times$ forewing pad length; secondary post-ocular and dorsal thoracic macrosetae shorter (maximum 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) (figure 21A) *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 Marginal abdominal macrosetae (other than sectasetae) one pair in first position (on *Teline microphylla*; Gran Canaria) (figure 17A) *prognata* (Loginova)
- Marginal abdominal macrosetae (other than sectasetae) four pairs 12
- Marginal abdominal macrosetae (other than sectasetae) three pairs (absent from fourth 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 macrosetae; marginal abdominal setae (other than sectasetae) simple (on *Teline*; Gran Canaria, Tenerife) (figure 17B) *diluta* (Loginova)
- Antennae longer than 0.9 mm; proximal wing pad setae prominent; dorsal pre-caudal setae on anterior tergites; dorsal caudal plate macrosetae absent or reduced; marginal abdominal setae (other than sectasetae) mostly capitate (on *Genista florida*; Morocco) (figure 21B) *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) (figure 21D) *berber* sp. n.
- 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) (figure 21B) *cognata* (Loginova)
- 14 Marginal abdominal macrosetae (other than sectasetae) four pairs 15
- Marginal abdominal macrosetae (other than sectasetae) three pairs (absent from fourth position) 17
- 15 Forewing and hindwing pads each with more than five macrosetae on the surface and margin; dorsal pre-caudal setae on all tergites; dorsal caudal plate with numerous macrosetae, typically more than 20 (on *Teline stenopetala*; Tenerife) (figure 18C) *menceyata* sp. n.
- Forewing and hindwing pads each with one or two marginal macrosetae; dorsal post-wing setae on anterior tergites, or indistinct; dorsal caudal plate macrosetae absent or if present two to four 16
- 16 Forewing and hindwing pads each with one capitate macroseta apically, proximal setae short simple or indistinct; dorsal pre-caudal setae short simple or indistinct; dorsal caudal plate macrosetae absent (on *Chamaecytisus* and *Teline stenopetala*; La Palma, El Hierro) (figure 20B) *modica* (Loginova)
- Forewing and hindwing pads each with two macrosetae (apical and proximal), proximal setae prominent, simple or capitate; dorsal pre-caudal setae long simple or long capitate; dorsal caudal plate macrosetae present (on *Chamaecytisus*; Gran Canaria, Tenerife, La Gomera) (figure 20C) *dividens* (Loginova)
- 17 Forewing pad with two macrosetae (apical and proximal) (maximum length ≥ 0.1 mm) (on *Chamaecytisus*; Gran Canaria, Tenerife, La Gomera) (figure 27C) *dividens* (Loginova)
- Forewing pad with one macroseta apically (proximal seta short simple or indistinct) (maximum length less than 0.1 mm) 18
- Forewing pad with five or more macrosetae (maximum length ≥ 0.1 mm) 19
- 18 Apical forewing pad seta simple or narrowly capitate; marginal abdominal pleurite setae paired simple (on *Teline stenopetala*; La Gomera) (figure 20A) *hupalupa* sp. n.
- Apical forewing pad seta distinctly capitate; marginal abdominal pleurite setae paired

- capitate and simple (on *Chamaecytisus* and *Teline stenopetala*; La Palma, El Hierro) (figure 20B) *modica* (Loginova)
- 19 Antennae shorter than 0.8 mm, less than $1.3 \times$ head width, and $\leq 1.5 \times$ forewing pad length; hindwing pad with one macroseta apically paired with a small rod or simple seta, proximal seta indistinct; hind tibia with one capitate seta distally (on *Teline rosmarinifolia*; Gran Canaria) (figure 18B) *romeria* sp. n.
- Antennae longer than 0.8 mm, $\geq 1.3 \times$ head width, and greater than $1.5 \times$ forewing pad length; hindwing pad with two or more macrosetae, apically with two paired capitate setae, proximal seta distinct; hind tibia with two or more capitate setae 20
- 20 Antennae shorter than $1.7 \times$ forewing pad length; ocular seta small, inconspicuous; 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; hindwing pad capitate macrosetae two (apical) (on *Teline splendens*; La Palma) (figure 18A) *fortunata* sp. n.
- Antennae longer than $1.7 \times$ forewing pad length; ocular seta long, conspicuous; 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; hindwing pad capitate macrosetae more than two (apical and proximal) (on *Teline*; Tenerife) (figure 19C) *pileolata* (Loginova)

Arytinnis pileolata (Loginova) comb. n.

(figure 19C)

Arytainilla pileolata Loginova, 1976: 26; Hodkinson and Hollis, 1987: 42.

Adult

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

Description. Loginova (1976).

Nymph

Colour. First to third instars cream and black or orange-red, 4th–5th instars green with black tergites.

Fifth instar structure. Antennal segments seven.

Fifth instar measurements. (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; HW: 0.64–0.68; AL: 0.91–0.96.

Fifth instar chaetotaxy. Head setae simple; ocular seta simple or occasionally narrowly capitate, dark, conspicuous; primary and secondary post-ocular setae distinctly capitate. Dorsal thoracic setae long, capitate only or with simple. Forewing pad macrosetae six to nine, distinctly capitate, marginal (four or five larger, one to three smaller and one proximal); hindwing pad macrosetae three or four, distinctly capitate, surface and marginal (one or two apical, one surface, one proximal); simple or sometimes rod microsetae on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, long capitate, caudal plate macrosetae absent or two, distinctly capitate; sectasetae four pairs (first pair sometimes reduced); marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate; pleurite setae paired capitate and simple. Foreleg without capitate setae; middle leg without capitate setae or one on tibia (distal) with or without small rod proximally; hind leg capitate setae on tibia, two or three (one proximal, one or two distal) with four or five 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. n., 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 (1st–2nd instars) were observed at the base of developing fruit under the persistent calyx, and in leaf buds.

Material examined. (Ex *Teline canariensis* unless otherwise stated) **Canary Islands, Tenerife:** 20♂♀, Anaga, El Bailadero, 19 May 1987, D. Hollis (BMNH). 1♂, 6♀, 7 nymphs, rd Buenavista to Santiago del Teide, 28°19'N, 16°50'30"W, 900 m, 28 June 1997 (DP 21). 4♂, 4♀, 2 nymphs, Anaga, rd El Bailadero to Taganana, 28°32'30"N, 16°12'W, 550 m, 30 June 1997 (DP 30). 14♂, 12♀, 2 nymphs, Teno, 7 km S of Buenavista, 28°20'N, 16°51'W, ca. 800 m, 4 April 1998 (DP 152). 14♂, 16♀, above El Portezuelo, nr El Pulpito, 28°29'30"N, 16°21'15"W, ca. 600 m, 25 April 1998 (DP 178). 4♂, 4♀, 2 nymphs, Güímar, Caldera de Pedro Gil, 28°20'30"N, 16°28'W, 1775 m, ex *Teline stenopetala*, 26 April 1998 (DP 182). 39♂, 35♀, 14 nymphs, Barranco de Herques, 28°14'45"N, 16°26'30"W, ca. 500–600 m, ex *Teline osyroides*, 2 May 1998 (DP 184). 19♂, 11♀, 1 nymph, Barranco del Rey, 28°06'30"N, 16°41'30"W, ca. 700 m, ex *Teline osyroides*, 10 May 1998 (DP 186). 2♂, 8♀, 2 nymphs, nr La Vega, 28°20'30"N, 16°44'W, ca. 800 m, ex *Teline stenopetala* and hybrids x *T. canariensis*, 31 May 1998 (DP 229).

Arytinnis nigrilineata (Loginova) comb. n.
(figures 2H, C, 17C)

Arytainilla nigrilineata Loginova, 1976: 19; Hodkinson and Hollis, 1987: 42.

Adult

Colour. Bright green, lacking the darker coloration 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.

Description. Loginova (1976).

Nymph

Colour. First and second instars pale orange or cream, 3rd–5th instars pale green to bright green or orange and cream, with or without black tergites.

Fifth instar structure. Antennal segments nine.

Fifth instar measurements. (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; HW: 0.69–0.74; AL: 0.99–1.18.

Fifth instar chaetotaxy. Head setae simple; ocular seta simple, dark, conspicuous; primary and secondary post-ocular setae simple or narrowly capitate. Dorsal thoracic setae long, simple and narrowly capitate. Forewing and hindwing pads with simple or narrowly capitate setae; each pad with two macrosetae, marginal (one apical, one proximal); hindwing pad apical seta paired with small simple seta; simple

microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, long simple and narrowly capitate, caudal plate macrosetae, usually four simple or narrowly capitate; sectasetae three pairs; marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate; pleurite setae paired simple or slightly capitate. Legs with simple setae only.

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. **Canary Islands, Gran Canaria:** 26♂, 20♀, 50 nymphs, 1–2 km S of Cruz de Tejada, 27°59'30"N, 15°36'W, 1480 m, 5 July 1997 (DP 36). 9♂, 10♀, 1 nymph, just below Pinos de Gáldar, 28°2'30"N, 15°37'30"W, 1400 m, 6 July 1997 (DP 43). 19♂, 14♀, rd Moya to San Bartolomé de Fontanales, 28°5'45"N, 15°35'15"W, ca. 700 m, 19 April 1998 (DP 170). **Tenerife:** 20♂♀, La Esperanza, 1 July 1966, Guichard and Ward (BMNH). 5♂, 9♀, 2 nymphs, 5 km NE of Las Canteras, 28°31'N, 16°18'W, 700 m, 30 June 1997 (DP 29). 4♂, rd La Laguna to El Teide, ca. 20 m before turning to Arafo, 28°23'30"N, 16°26'30"W, 1650 m, ex *Adenocarpus* hybrids, *viscosus* x *foliolosus*, 9 July 1997 (DP 52). 31♂, 16♀, 8 nymphs, 3–5 km above Las Raíces, 28°25'N, 16°23'30"W, 1350 m, 11 April 1998 (DP 156). **La Gomera:** 112♂, 72♀, 30 nymphs, rd from Arure to Las Hayas, 28°7'30"N, 17°18'30"W, 900 m, 13 July 1997 (DP 67). 30♂, 30♀, 23 nymphs, nr Tamagarda and Las Rosas, 28°11'30"N, 17°13'30"W, ca. 600 m, 26 May 1998 (DP 223).

Arytainis proboscidea (Loginova) comb. n.
(figure 17D)

Arytainilla proboscidea Loginova, 1976: 18; Hodkinson and Hollis, 1987: 42.

Adult

Colour. Generally bright green to mid-green though more mature males and females, but particularly females, develop brown to black coloration 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.

Description. Loginova (1976).

Nymph

Colour. First to third instars cream and orange, 4th–5th instars bright green and orange, with or without black tergites.

Fifth instar structure. Antennal segments nine.

Fifth instar measurements. (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; HW: 0.68–0.75; AL: 1.01–1.1.

Fifth instar chaetotaxy. Head setae simple; ocular seta simple, inconspicuous; primary and secondary post-ocular setae simple. Dorsal thoracic setae long simple. Forewing and hindwing pads with simple setae, each pad with two macrosetae (occasionally slightly capitate), marginal (one apical, one proximal); hindwing pad apical seta paired with small simple seta; simple microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, long simple, caudal plate macrosetae, six simple or narrowly capitate; sectasetae three pairs; marginal abdominal setae (other than sectasetae) three pairs, simple or narrowly capitate; pleurite setae paired simple. Legs with simple setae only.

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 (1st–5th 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 ♂ recorded) or Gran Canaria (one ♀ 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 5th instars nymphs with nine antennal segments.

Material examined. (Ex *Adenocarpus viscosus* unless otherwise stated) **Canary Islands, Tenerife:** 20♂♀, Teide, Rte C823, 10 May 1987, D. Hollis (BMNH). 50♂, 50♀, 5 nymphs, Miradores de la Cumbre, 28°23'30"N, 16°26'W, 1800 m, 22 June 1997 (DP 5). 36♂, 14♀, 17 nymphs, ca 14 km S of Aguamansa, 28°19'N, 16°33'30"W, 1200 m, 29 June 1997 (DP 24). 5♂, rd La Laguna to El Teide, ca 20 m NE of turning to Arafo, 28°23'30"N 16°26'30"W, 1650 m, ex *Adenocarpus* hybrids, *viscosus* x *foliolosus*, 9 July 1997 (DP 52). 14♂, 16♀, 12 nymphs, above Roques Imoque and Brezo, nr Trevejos, 28°29'15"N, 16°39'15"W, ca 1300 m, 10 May 1998 (DP 187). **La Palma:** 4♂, 6♀, 1 nymph, SE rd Santa Cruz to La Caldera 28°43'N, 17°46'W, 950 m,

ex *Adenocarpus foliolosus*, 15 July 1997 (DP 72). 17♂, 7♀, 108 nymphs, Fuente de Olén, 28°43'30"N, 17°48'W, 1730 m, 15 July 1997 (DP 76). 4♂, 5♀, 5 nymphs, nr Gallegos, 28°48'N, 17°52'W, ca 600 m, ex *Adenocarpus viscosus* and hybrids with *A. foliolosus*, 19 May 1998 (DP 199).

Arytinnis equitans (Loginova) comb. n.
(figures 10B, 19D)

Arytainilla equitans Loginova, 1976: 25; Hodkinson and Hollis, 1987: 42.

Adult

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

Description. Loginova (1976).

Nymph

Colour. First to second instars orange-red with black tergites, 3rd–5th instars cream or green with black tergites.

Fifth instar structure. Antennal segments seven.

Fifth instar measurements. (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; HW: 0.66–0.72; AL: 0.97–1.05.

Fifth instar chaetotaxy. Head setae simple; ocular seta simple, dark, conspicuous; primary and secondary post-ocular setae simple or narrowly to distinctly capitate. Dorsal thoracic setae long, simple only or with capitate. Forewing and hindwing pads each with two macrosetae, marginal (one apical distinctly capitate, one proximal capitate or simple); forewing pad with up to five smaller marginal simple or rod setae; hindwing pad apical seta paired with small simple seta; simple or rod microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, long capitate, caudal plate macrosetae absent or if present, typically two distinctly capitate; sectasetae three pairs (small simple seta in first position); marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate; pleurite setae paired capitate and simple. Legs with simple setae only or with capitate setae present on hind leg tibia, one (proximal) capitate or small rod (occasionally small rod setae proximally on fore and middle leg tibiae).

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, personal communication).

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

Material examined. (Ex *Teline microphylla* unless otherwise stated) **Canary Islands, Gran Canaria:** 45♂, 39♀, 18 nymphs, 1–2 km S of Cruz de Tejada, 27°59'30"N, 15°36'W, 1480 m, 5 July 1997 (DP 35). 3♂, 4♀, 2 nymphs, rd Moya to Fontanales, 28°5'30"N, 15°35'W, ca 600 m, ex *Teline canariensis*, 6 July 1997 (DP 41). 6♂, 12♀, ca 5 km S of Moya, 28°5'N, 15°35'30"W, ca 800 m, ex *Teline stenopetala*, 15 April 1998 (DP 158). 39♀, 55♀, 16 nymphs, between Agualatente and La Culata, 27°56'N, 15°34'W, 1100 m, 16 April 1998 (DP 163). 47♂, 32♀, 2 nymphs, 1–2 km S of Cruz de Tejada, 28°00'N, 15°36'W, 1420 m, 20 April 1998 (DP 175).

Arytinnis prognata (Loginova) comb. n.
(figure 17A)

Arytainilla prognata Loginova, 1976: 28; Hodkinson and Hollis, 1987: 42.

Adult

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

Description. Loginova (1976).

Nymph

Colour. First to second instars orange-red with black tergites, 3rd–5th instars bright green, grey-green or cream, with or without black tergites.

Fifth instar structure. Antennal segments seven.

Fifth instar measurements. (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; HW: 0.57–0.67; AL: 0.82–0.9.

Fifth instar chaetotaxy. Head setae simple; ocular seta simple, dark, conspicuous; primary post-ocular seta narrowly or distinctly capitate; secondary post-ocular seta simple. Dorsal thoracic setae simple, short with few longer. Forewing and hindwing pads each with one apical macroseta, distinctly capitate; hindwing pad apical seta paired with small simple seta; proximal setae indistinct from simple microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae on anterior tergites, long simple, caudal plate macrosetae absent; sectasetae four pairs; marginal abdominal setae (other than sectasetae) one pair (first position), distinctly capitate; pleurite setae paired simple, occasionally slightly capitate. Legs with simple setae only.

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 develop at different times, 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:** Holotype ♂ (dry mounted) and 2♀ paratypes, Valle de Tejada, 28–29 March 1949, H. Lindberg (ZMH). 14♂, 13♀, 19 nymphs, above Fataga, 27°54'N, 15°34'W, ca 800 m, 16 April 1998 (DP

160). 2♂, 8 nymphs, between Agualatente and La Culata, 27°56'N, 15°34'W, 1100 m, 16 April 1998 (DP 163).

Arytinnis diluta (Loginova) comb. n.
(figures 10A, 17B)

Arytainilla diluta Loginova, 1976: 24; Hodkinson and Hollis, 1987: 42.

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.

Description. Loginova (1976).

Nymph

Colour. Fifth instars bright green to yellow or cream, with black tergites.

Fifth instar structure. Antennal segments seven.

Fifth instar measurements. (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.

Fifth instar chaetotaxy. Head setae simple; ocular seta simple, dark, conspicuous; primary and secondary post-ocular setae simple. Dorsal thoracic setae short simple. Forewing and hindwing pads with simple setae only, forewing pad with one apical macroseta and up to eight smaller marginal setae; hindwing pad with one apical macroseta (paired with one smaller); proximal setae indistinct from simple microsetae on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on posterior tergites, long simple, caudal plate macrosetae present, six to eight, simple; sectasetae four pairs; marginal abdominal setae (other than sectasetae) four pairs, simple; pleurite setae paired simple. Legs with simple setae only.

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 develop at different times, 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 to May.

Biology. Nymphs were observed on leaf buds.

Material examined. **Canary Islands, Gran Canaria:** ex *Teline microphylla*: 61♂, 50♀, 1 km N of Cruz de Tejada, 28°30'N, 15°35'30"W, ca 1500 m, 20 April 1998 (DP 172). 9♂, 28♀, 1 nymph, 1–2 km S of Cruz de Tejada, 28°00'N, 15°36'W, 1420 m, 20 April 1998 (DP 175). **Tenerife:** ex *Teline canariensis*: 1♂, 1♀, 3 nymphs, rd Buenavista to Santiago del Teide, 28°19'N, 16°50'30"W, 900 m, 28 June 1997 (DP 21). 13♂, 17♀, 1 nymph, Teno, 7 km S of Buenavista, 28°20'N, 16°51'W, ca 800 m,

4 April 1998 (DP 152). 15♂, 15♀, Anaga, E of El Bailadero, 28°33'15"N, 16°10'30"W, ca 800 m, 1 May 1998 (DP 183).

Arytinnis romeria sp. n.
(figures 2J, 4, 18B)

Adult

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

Structure. Surface forewing spinules present in all cells but reduced in cell $c + sc$, medium density: 40–60 per 0.1 mm^2 ; apical spines in wing cells cu_1 , m_1 and m_2 , and absent, or more typically few present in cell r_2 . Antennae short; genal cones very short. Male genitalia as in figure 4F–I; paramere simple, apex in dorsal view contiguous anteriorly and rounded with an acute point. Female genitalia as in figure 4E; proctiger dorsal profile more or less straight or with slight post anal depression.

Adult measurements and ratios. (4♂, 5♀) Total length: ♂ 2.6–2.8484, ♀ 2.96–3.16; WL: ♂ 2.2–2.25, ♀ 2.25–2.45; HW: ♂ 0.75–0.77, ♀ 0.77–0.81; AL: 1.1–1.27; GC: 0.08–0.11; PB: 0.16–0.18. WLPT: 2.84–3.36; GCVL: 0.4–0.58; VLW: 0.39–0.48; WLW: 2.37–2.53; CUR: 1.59–1.84; MR: 0.43–0.53; TLFL: 1.06–1.16. Adult genitalia ♂: MP: 0.22–0.23; PL: 0.3–0.31; AEL: 0.23–0.24; MSLH: 1.21–1.31; AHS: 0.27–0.28; PLSH: 1.11–1.15. ♀: 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.

Nymph

Colour. First to third instars orange-red with black tergites, 4th–5th instars mid-green.

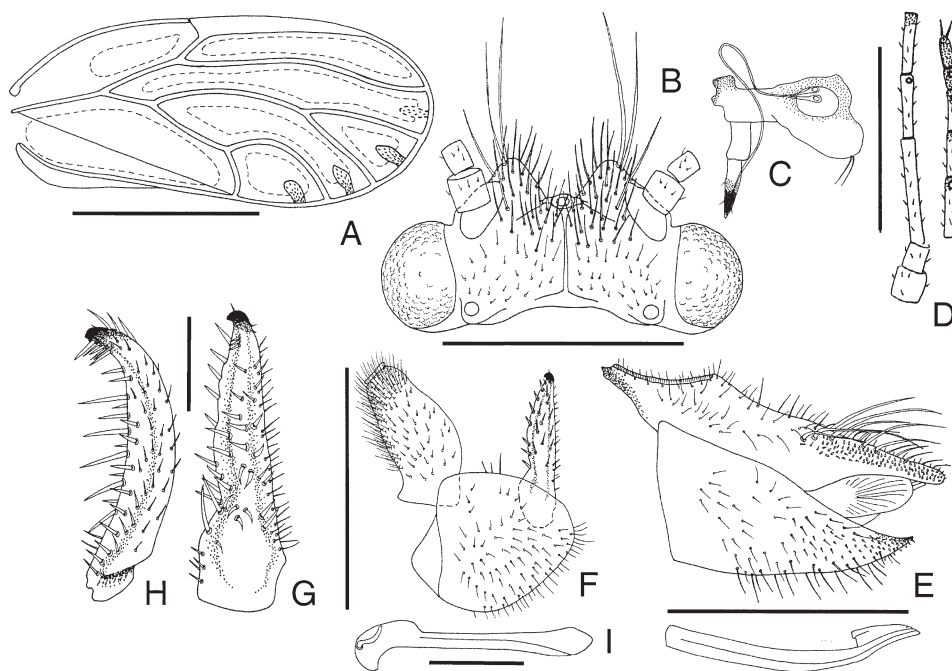


FIG. 4. Adult *Arytinnis romeria* sp. n. (A–I) as figure 3.

Fifth instar structure. Antennal segments seven.

Fifth instar measurements. (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; HW: 0.61–0.64; AL: 0.72–0.78.

Fifth instar chaetotaxy. Head setae simple and narrowly capitate; ocular seta simple, inconspicuous; primary and secondary post-ocular setae distinctly or narrowly capitate. Dorsal thoracic setae short simple. Forewing pad macrosetae seven to ten, distinctly capitate, marginal (four to five larger, three to five smaller), proximal seta short simple or narrowly capitate; hindwing pad with one apical macroseta, distinctly capitate and paired with one small rod seta, proximal seta indistinct from simple microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, short simple and capitate, caudal plate macrosetae absent; sectasetae four pairs; marginal abdominal setae (other than sectasetae) three pairs (fourth may be reduced, simple or absent), distinctly capitate; pleurite setae paired capitate and simple. Foreleg without capitate setae; middle and hind legs with capitate setae on tibiae, 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 *et al.*, 1995). Two subspecies of the host have been recognized but only one was sampled. *A. romeria* sp. n. was found on 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 April 1998 (BMNH). Paratypes 14♂, 20♀, 6 nymphs, as for holotype (BMNH). 1♂, 1♀, as for holotype (DZUL). 2♂, 2♀, as for holotype (NHMB).

Arytinnis fortunata sp. n.

(figures 5, 10D, 18A)

Adult

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

Structure. Surface forewing spinules present throughout all cells, but reduced in cell c+sc, medium density: 40–60 per 0.1 mm²; apical spines in wing cells cu₁, m₁ and m₂, and few present in cell r₂. Antennae mid-length; genal cones short. Male genitalia as in figure 5F–I; paramere simple, apex in dorsal view contiguous along inner margin (figure 10D). Female genitalia as in figure 5E; proctiger dorsal profile more or less straight.

Adult measurements and ratios. (4♂, 5♀) total length: ♂ 2.92–3.12, ♀ 3–3.44; WL: ♂ 2.33–2.5, ♀ 2.39–2.76; HW: ♂ 0.77–0.79; ♀ 0.76–0.83; AL: 1.52–1.71; GC: 0.1–0.13; PB: 0.14–0.15. WLPT: 2.75–2.99; GCVL: 0.45–0.65; VLW: 0.4–0.49;

WLW: 2.38–2.53; CUR: 1.79–1.93; MR: 0.47–0.54; TLFL: 1.13–1.21. Adult genitalia ♂: MP: 0.26–0.27; PL: 0.36–0.37; AEL: 0.24–0.25; MSLH: 1.19–1.3; AHS: 0.3–0.31; PLSH: 1.13–1.2. ♀: 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.

Nymph

Colour. First and second instars orange and cream, 5th instars bright green.

Fifth instar structure. Antennal segments seven.

Fifth instar measurements. (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; HW: 0.65–0.71; AL: 0.9–0.94.

Fifth instar chaetotaxy. Head setae simple; ocular seta simple, inconspicuous; primary post-ocular seta distinctly or occasionally narrowly capitate; secondary post-ocular seta simple. Dorsal thoracic setae short simple. Forewing pad with 9–11 macrosetae, marginal (three to five larger distinctly capitate and up to six smaller narrowly capitate or simple); hindwing pad with two apical macrosetae, distinctly capitate; proximal setae short simple; simple or rod microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, short simple, caudal plate macrosetae absent; sectasetae four pairs; marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate; pleurite setae paired capitate and simple. Foreleg without capitate setae; middle leg capitate setae on tibia, one (distal); hind leg capitate setae on femur and tibia or tibia only (femur seta either capitate or simple), on tibia 3 (one larger distal, two smaller proximal and occasionally up to two small rod setae).

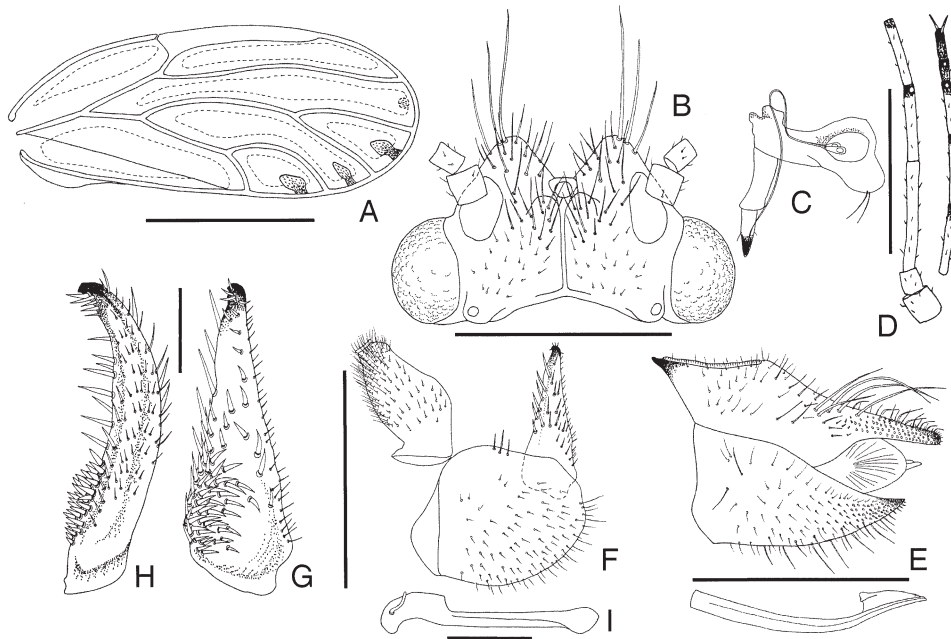


FIG. 5. Adult *Arytinnis fortunata* sp. n. (A–I) as figure 3.

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. n. 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. n. 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 (1st–2nd instars) were observed on leaf buds and fruit usually under the persistent calyx. Large nymphs (3rd–5th 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, ca 600 m, 20 May 1998 (BMNH). Paratypes 54♂, 57♀, 41 nymphs, as for holotype (BMNH). 2♂, 1♀, 5 nymphs, as for holotype (DZUL). 3♂, 2♀, 5 nymphs, as for holotype (NHMB).

Other material examined. **La Palma:** 22♂, 14♀, 25 nymphs, SE rd Santa Cruz to La Caldera 28°42'30"N, 17°46'W, 790 m, 16 July 1997 (DP 78).

Arytinnis canariensis sp. n.
(figures 2I, 6)

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, sparse: less than 40 per 0.1 mm²; apical spines in wing cells cu₁, m₁ and m₂, and in cell r₂ but not to the margin. Antennae mid-length; genal cones very short, terminal setae darkly pigmented. Distal proboscis segment long. Male genitalia as in figure 6F–I; paramere apex in dorsal view contiguous posteriorly with the inner margin straight edged. Female genitalia as in figure 6E; egg with stout lateral pedicel at the base.

Adult measurements and ratios. (3♂, 3♀) Total length: ♂ 2.64–2.92, ♀ 2.88–3.4; WL: ♂ 2.18–2.3, ♀ length 2.35–2.68; HW: ♂ 0.72–0.77, ♀ 0.77–0.82; AL: 1.5–1.65; GC: 0.06–0.08; PB: 0.2–0.25. WLPT: 2.85–3.35; GCVL: 0.3–0.42; VLW: 0.41–0.48; WLW: 2.28–2.4; CUR: 1.75–2.08; MR: 0.47–0.58; TLFL: 1.31–1.39. Adult genitalia ♂: MP: 0.33–0.35; PL: 0.38–0.39; AEL: 0.27–0.28; MSLH: 1.15–1.26; AHS: 0.34–0.35; PLSH: 1.18–1.23. ♀: FP: 0.73–0.81; FSP: 0.48–0.55; RL: 0.19–0.23; OV: 0.15; EL: 0.25–0.29.

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. n. and *A. diluta*, and was the most common species in this particular location.

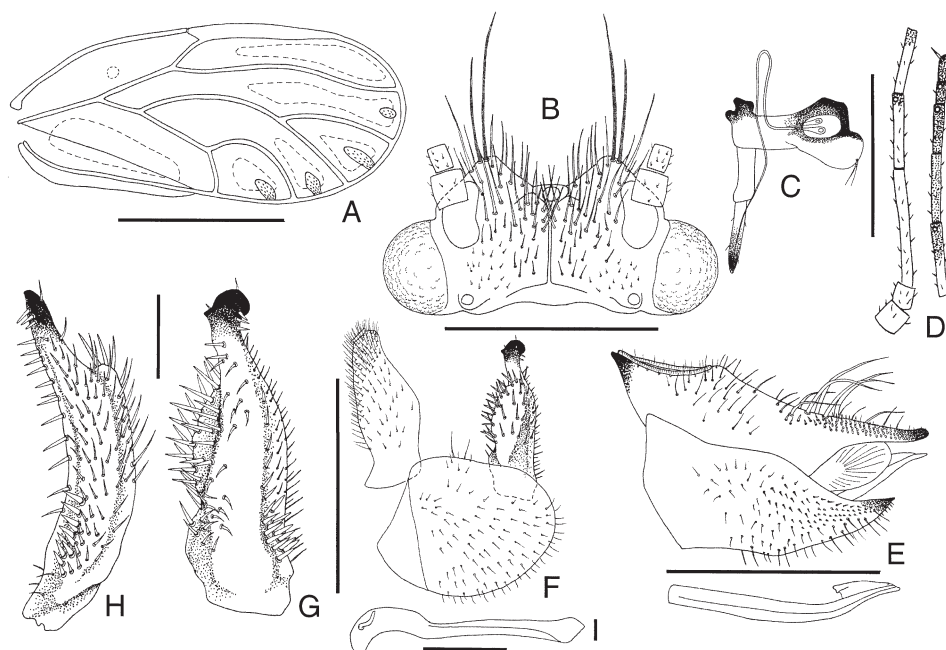


FIG. 6. Adult *Atytinnis canariensis* sp. n. (A–I) as figure 3.

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

Type material. Holotype ♂ (slide mounted), **Canary Islands, Tenerife:** Anaga, E of Pico del Inglés, 28°32'15"N, 16°16'30"W, ca 960 m, 25 April 1998 (BMNH). Paratypes 12♂, 10♀, as for holotype (BMNH). 1♂, 1♀, as for holotype (DZUL). 1♂, 1♀, as for holotype (NHMB).

Atytinnis menceyata sp. n.
(figures 7, 18C)

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 $c + sc$, dense: 60–100 per 0.1 mm^2 ; apical spines in wing cells cu_1 , m_1 and m_2 , but absent from cell r_2 . Antennae short; genal cones very short. Genitalia large and robust. Male genitalia as in figure 7F–I; paramere apex in dorsal view contiguous posteriorly with inner margin concave; aedeagus distal segment with a well-developed, curved hook, tip not or only slightly turning upwards; male subgenital plate dorsal profile raised anteriorly with a distinct step. Female genitalia as in figure 7E.

Adult measurements and ratios. (3♂, 3♀) total length: ♂ 2.6–2.84, ♀ 2.8–3; WL: ♂ 2.13–2.2, ♀ 2.35–2.4; HW: ♂ 0.71–0.72, ♀ 0.73–0.75; AL: 1.23–1.35; GC: 0.08–0.1; PB: 0.16–0.17. WLPT: 2.73–3.14; GCVL: 0.38–0.56; VLW: 0.41–0.5; WLW: 2.37–2.42; CUR: 1.57–1.81; MR: 0.42–0.49; TLFL: 1.18–1.26. Adult genitalia ♂: MP: 0.33–0.37; PL: 0.58–0.59; AEL: 0.36; MSLH: 1.33–1.4; AHS: 0.24; PLSH: 1.4–1.49. ♀: FP: 0.97–1; FSP: 0.6–0.63; RL: 0.15–0.19; OV: 0.24; EL: 0.24–0.27.

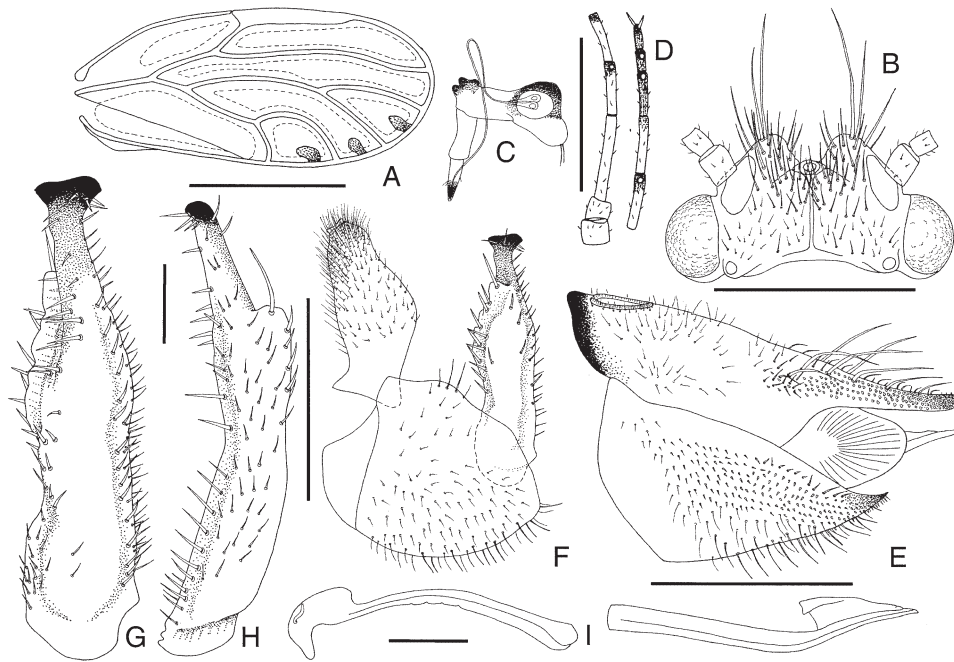


FIG. 7. Adult *Atytinnis menceyata* sp. n. (A–I) as figure 3.

Nymph

Colour. First to second instars cream and orange with black tergites, 5th instars pale grey-green.

Fifth instar structure. Antennal segments seven.

Fifth instar measurements. (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.

Fifth instar chaetotaxy. Head setae simple; ocular seta simple, typically dark and conspicuous; primary post-ocular seta distinctly capitate; secondary post-ocular seta simple or narrowly capitate. Dorsal thoracic setae short simple and long capitate. Forewing pad macrosetae 17–23, distinctly capitate, surface and marginal (10 marginal, 6–12 surface, one proximal); hindwing pad macrosetae 6–11, distinctly capitate, surface and marginal (two apical, three to eight surface, one proximal); proximal setae distinctly or narrowly capitate; numerous simple microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on all tergites, short simple and long narrowly capitate, caudal plate macrosetae ± 25 , distinctly capitate; sectasetae four pairs; marginal abdominal setae (other than sectasetae) four pairs, distinctly capitate; pleurite setae paired capitate and simple. Foreleg capitate setae on tibia, one (proximal, occasionally simple); middle leg capitate setae on tibia, two (one proximal, one distal); hind leg capitate setae on tibia three to four (two proximal, two 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 (1st–2nd 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 ♂ (slide mounted), **Canary Islands, Tenerife:** Güímar, Caldera de Pedro Gil, 28°20'30"N, 16°28'W, 1775 m, ex *Teline stenopetala*, 26 April 1998 (BMNH). Paratypes 26♂, 26♀, 3 nymphs, as for holotype (BMNH). 2♂, 1♀, as for holotype (DZUL). 2♂, 2♀, as for holotype (NHMB).

Other material examined. **Tenerife:** 1♂, 3♀, Anaga, E of Pico del Inglés, 28°32'15"N 16°16'30"W, ca 960 m, ex *Teline canariensis*, 25 April 1998 (DP 179).

Arytinnis ochrita sp. n.
(figures 8, 20D)

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, medium density: 40–60 per 0.1 mm²; apical spines in wing cells cu₁, m₁ and m₂, but absent, or occasionally few present in cell r₂. Antennae short; genal cones short. Male genitalia as in figure 8F–I; paramere with a reduced medially positioned ridge, apex in dorsal view contiguous along inner margin. Female genitalia as in figure 8E.

Adult measurements and ratios. (4♂, 4♀) total length: ♂ 2.2–2.52, ♀ 2.4–2.68; WL: ♂ 1.7–1.98, ♀ 1.88–2.08; HW: ♂ 0.63–0.66, ♀ 0.64–0.67; AL: 1.08–1.27; GC: 0.08–0.11; PB: 0.11–0.13. WLPT: 2.72–2.97; GCVL: 0.42–0.61; VLW: 0.44–0.53; WLW: 2.38–2.54; CUR: 1.65–2.09; MR: 0.44–0.53; TLFL: 1.17–1.24. Adult genitalia ♂: MP: 0.25–0.28; PL: 0.36–0.38; AEL: 0.24–0.26; MSLH: 1.35–1.5; AHS: 0.29–0.31; PLSH: 1.46–1.57. ♀: 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.

Nymph

Colour. Third instars orange-yellow, 4th–5th instars yellow-green with black tergites.

Fifth instar structure. Antennal segments seven.

Fifth instar measurements. (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; HW: 0.58–0.58; AL: 0.75–0.75.

Fifth instar chaetotaxy. Head setae simple and occasionally narrowly capitate; ocular seta inconspicuous; primary post-ocular seta distinctly capitate; secondary post-ocular seta indistinct, small simple. Dorsal thoracic setae short simple. Forewing and hindwing pads each with one, distinctly capitate, apical macroseta, paired with small simple seta on the hindwing pad; proximal setae indistinct; simple microsetae scattered on wing pad surfaces. Dorsal abdominal pre-caudal macrosetae absent (small simple only), caudal plate macrosetae absent; sectasetae three pairs (small capitate seta in first position); marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate; pleurite setae paired capitate and simple or small rod.

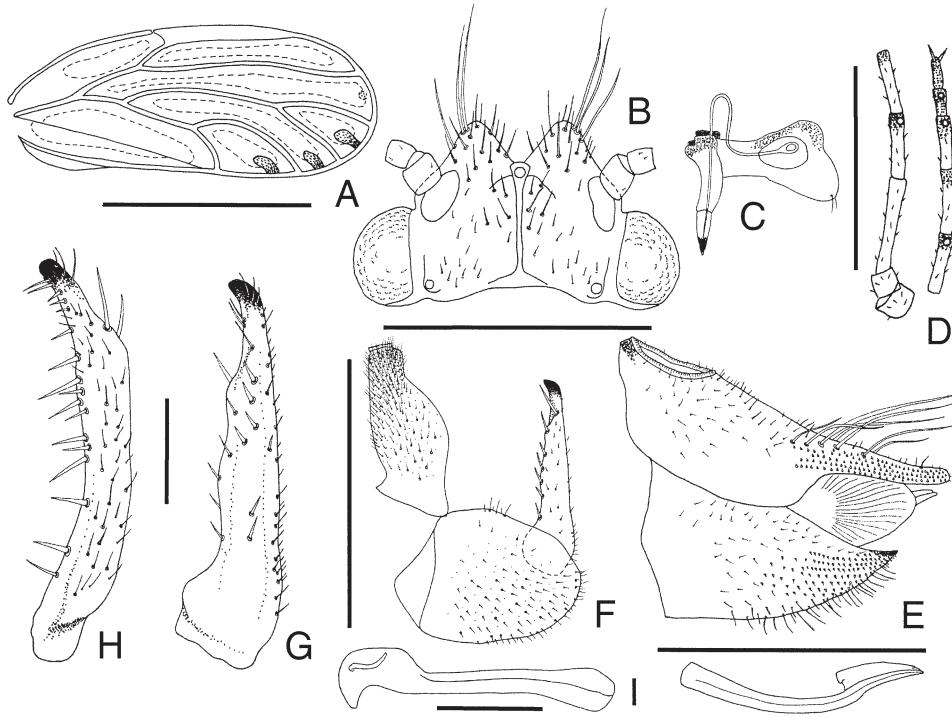


FIG. 8. Adult *Atytinnis ochrita* sp. n. (A–I) as figure 3.

Foreleg without capitae setae; middle leg probably with one capitae seta on tibia (distal); hind leg with one capitae seta on tibia (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 ca 1000–2000 individuals around the Masca valley region of northwestern Tenerife. This is the smallest and possibly rarest species in *Atytinnis* gen. n.

Etymology. Named for the small size and ochre coloration using the familiar diminutive form in Spanish.

Type material. Holotype ♂ (slide mounted), **Canary Islands, Tenerife:** Barranco de Masca, 28°18'N, 16°50'30"W, ca 600 m, 4 April 1998 (BMNH). Paratypes 7♂, 5♀, 1 nymph, as for holotype (BMNH). 2♀, as for holotype except, 2 July 1997 (BMNH). 1♂, 1♀, as for holotype (DZUL). 1♂, 2♀, as for holotype (NHMB).

Atytinnis occidentalis sp. n.
(figures 9, 10C, 19B)

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, density sparse: less than 40 per 0.1 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 long; genal cones short. Male genitalia as in figure 9F–I; paramere with a medial ridge present on the inner surface, apex in dorsal view contiguous anteriorly with inner margin concave (figure 10C); aedeagus distal segment with a well-developed, curved hook. Female genitalia as in figure 9E; egg with stout lateral pedicel at the base.

Adult measurements and ratios. (6♂, 6♀) total length: ♂ 2.92–3.48, ♀ 3.08–3.88; WL: ♂ 2.4–2.72, ♀ 2.55–3; HW: ♂ 0.76–0.82, ♀ 0.8–0.89; AL: 1.7–2.1; GC: 0.1–0.13; PB: 0.14–0.19. WLPT: 2.83–3.33; GCVL: 0.46–0.57; VLW: 0.45–0.5; WLW: 2.38–2.58; CUR: 1.63–2.04; MR: 0.42–0.55; TLFL: 1.16–1.22. Adult genitalia ♂: MP: 0.24–0.27; PL: 0.35–0.4; AEL: 0.28–0.31; 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.

Nymph

Colour. First to third instars cream and orange-red, 4th–5th instars pale grey-green, blue-green or yellow-green, with or without black tergites.

Fifth instar structure. Antennal segments eight.

Fifth instar measurements. (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; HW: 0.64–0.73; AL: 1.1–1.15.

Fifth instar chaetotaxy. Head setae simple; ocular seta simple, typically dark and conspicuous; primary and secondary post-ocular setae simple or narrowly capitate. Dorsal thoracic setae long simple. Forewing pad macrosetae two, marginal (one apical, one proximal), apical seta distinctly capitate, proximal seta simple or narrowly capitate; hindwing pad with one apical macroseta, distinctly capitate, paired

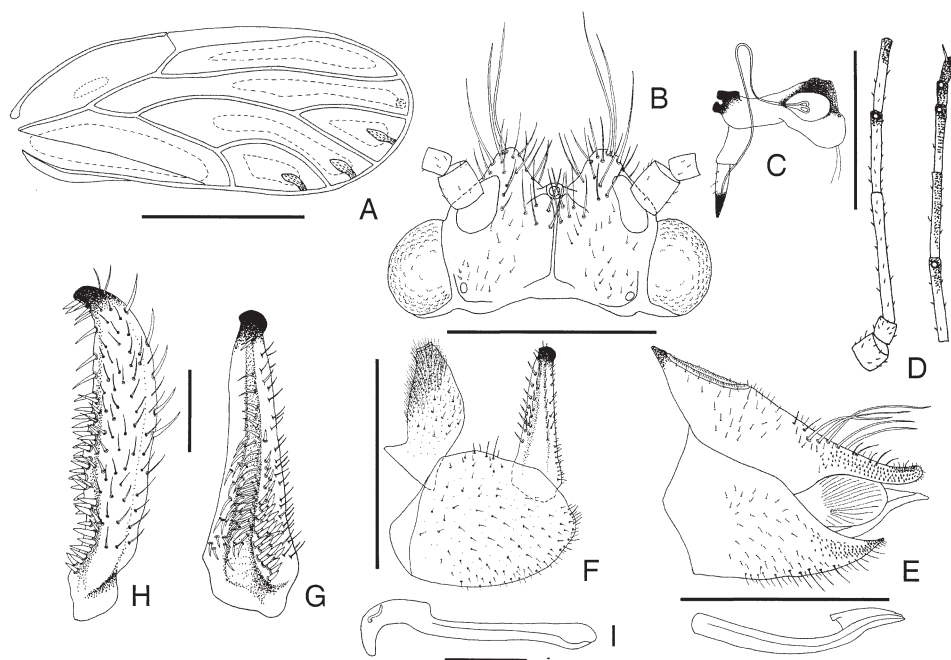


FIG. 9. Adult *Arytinnis occidentalis* sp. n. (A–I) as figure 3.

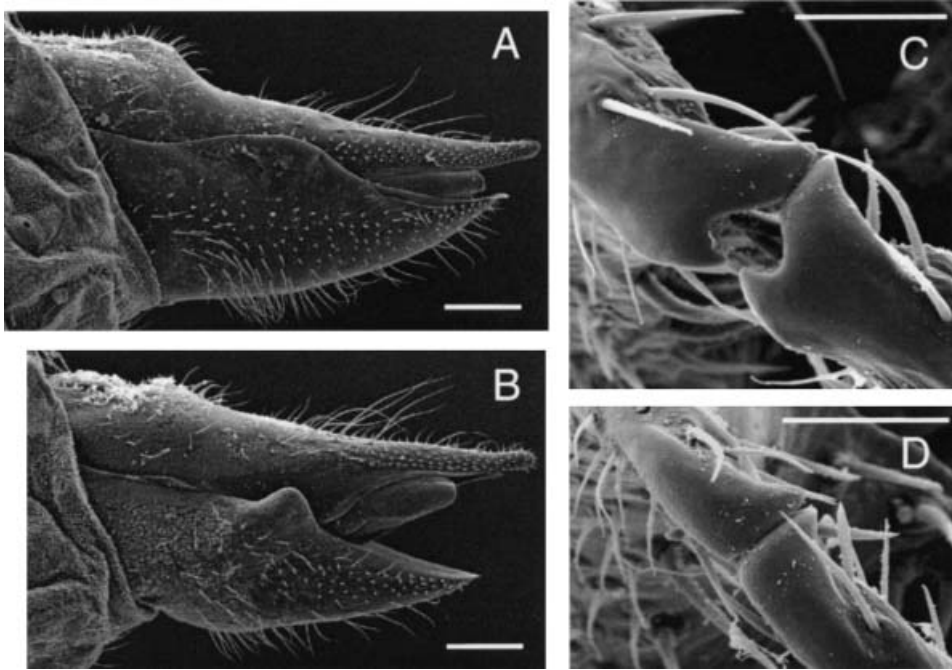


FIG. 10. SEM. (A, B) ♀ genitalia: (A) *Arytinnis diluta*; (B) *A. equitans* (scale bars = 0.1 mm). (C, D) ♂ parameres in dorsal view: (C) *Arytinnis occidentalis* sp. n.; (D) *A. fortunata* sp. n. (scale bars = 30 μm).

with small simple seta, proximal seta short simple; simple microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, long simple, caudal plate macrosetae typically absent or two simple or narrowly capitate; sectasetae four pairs; marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate; pleurite setae paired capitate and simple. Legs with simple setae only.

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*) different timing of development and habitat preference.

Biology. Eggs were found singly scattered on the calyx, in small clusters under floral bracts or at the base of developing fruit under the persistent calyx. Small nymphs (1st–3rd 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 (3rd–5th 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 ♂ (slide mounted), **Canary Islands, La Palma:** rd to La Cumbrecita, 28°41'15"N, 17°51'30"W, 1250 m, 16 May 1998 (BMNH). Paratypes 42♂, 41♀, 12 nymphs, as for holotype (BMNH). 2♂, 1♀, 5 nymphs, as for holotype (DZUL). 1♂, 2♀, 5 nymphs, as for holotype (NHMB). **El Hierro:** 61♂, 52♀, 5 nymphs, El Golfo, rd to Frontera, 27°44'N, 18°01'30"W, 1100 m, 22 May 1998 (BMNH). 1♀, as for previous (DZUL). 2♂, 1♀, as for previous (NHMB).

Other material examined. **La Palma:** 6♂, 4♀, 2 nymphs, SE rd Santa Cruz to La Caldera, 28°43'N, 17°46'W, 930 m, 15 July 1997 (DP 73). 2♂, 3♀, Los Tilos, Barranco del Agua, 28°47'30"N, 17°47'45"W, c. 500 m, 17 May 1998 (DP 192). 2♂, 3♀, ca 3 km E of Roque Faro, 28°48'15"N, 17°52'30"W, ca 900 m, 19 May 1998 (DP 200). **El Hierro:** 8♂, 5♀, El Golfo, rd to Frontera, 27°43'30"N, 18°1'30"W, 1070 m, 11 July 1997 (DP 61). 5♂, 3♀, between Mirador de la Peña and Mirador Jinama, 27°47'30"N, 17°58'W, 900–960 m, 12.vii.1997 (DP 63). 19♂, 7♀, nr Arbol Santo, 27°47'30"N, 17°56'30"W, ca 1000 m, 23 May 1998 (DP 214).

Arytinnis gomeræ sp. n.
(figures 11, 19A)

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, sparse: less than 40 per 0.1 mm²; apical spines in wing cells cu₁, m₁ and m₂, but absent, or occasionally few present in cell r₂. Antennae short; genal cones short. Distal proboscis segment short. Male genitalia as in figure 11F–I; paramere apex in dorsal view contiguous anteriorly with inner margin concave. Female genitalia as in figure 11E.

Adult measurements and ratios. (4♂, 4♀) total length: ♂ 2.32–2.76, ♀ 2.64–2.92; WL: ♂ 1.91–2.03, ♀ 2.18–2.29; HW: ♂ 0.69–0.73, ♀ 0.72–0.75; AL: 1.38–1.5; GC: 0.09–0.12; PB: 0.13–0.14. WLPT: 2.82–3.25; GCVL: 0.43–0.57; VLW: 0.43–0.51; WLW: 2.25–2.45; CUR: 1.58–1.77; MR: 0.43–0.52; TLFL: 1.13–1.22. Adult genitalia ♂: MP: 0.25–0.28; PL: 0.3; AEL: 0.26–.27; 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.

Nymph

Colour. First to second instars cream with red abdomens.

Fifth instar structure. Antennal segments eight.

Fifth instar measurements. (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; HW: 0.59–0.64; AL: 0.82–0.88.

Fifth instar chaetotaxy. Head setae simple and occasionally narrowly capitate; ocular seta simple, dark, conspicuous; primary and secondary post-ocular setae distinctly capitate. Dorsal thoracic setae short simple and long capitate. Forewing pad macrosetae two to six, distinctly capitate, marginal (one apical, one proximal, zero to four smaller marginal); hindwing pad macrosetae two, distinctly capitate, marginal (one apical, one proximal), apical seta paired with small simple seta; proximal setae distinctly capitate; simple microsetae scattered on the wing pad

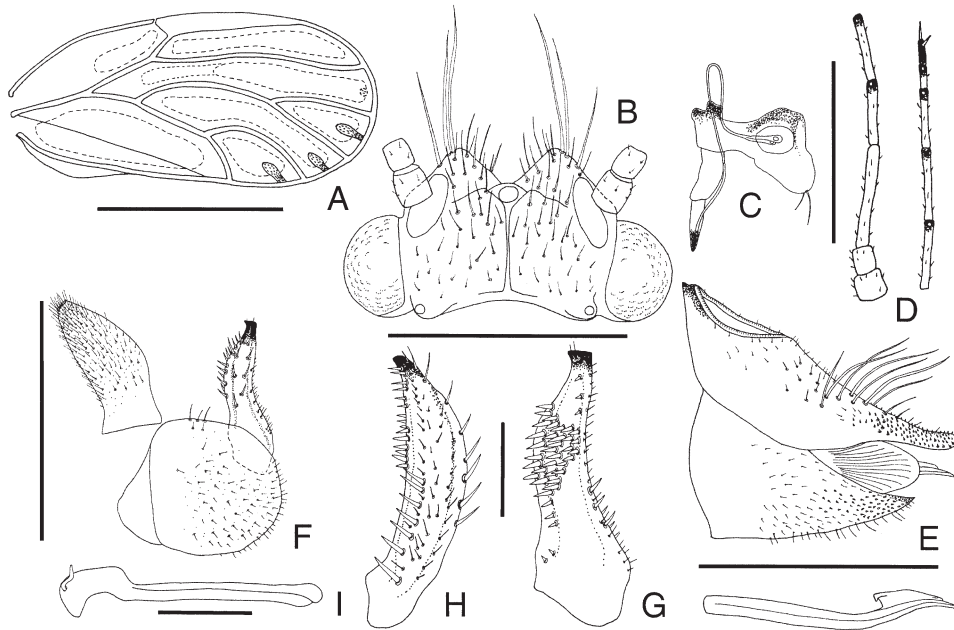


FIG. 11. Adult *Atytinnis gomerae* sp. n. (A–I) as figure 3.

surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, long simple and capitate, caudal plate macrosetae usually absent or one to four distinctly capitate; sectasetae three or four pairs (first may be reduced or simple); marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate; pleurite setae paired capitate and simple. Legs with simple setae only, small rod seta sometimes present proximally on hind tibia.

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

Distribution. Canary Islands: La Gomera.

Notes. Occurs sympatrically with *A. hupalupa* sp. n. 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. First to second instar nymphs were found on fruit and 2nd–5th 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 'horizontal' allopatric speciation as they occur on the same host plant and same habitat niche, but on different islands. Adult morphology and the unique feature of eight antennal segments in the 5th instar nymph supports a close relationship between these taxa.

Type material. Holotype ♂ (slide mounted), **Canary Islands, La Gomera:** below Roque Cano, 28°11'N, 17°15'30"W, 300–400 m, 26 May 1998 (BMNH). Paratypes

23♂, 18♀, 31 nymphs, as for holotype (BMNH). 1♂, 2♀, 5 nymphs, as for holotype (DZUL). 2♂, 2♀, 5 nymphs, as for holotype (NHMB).

Other material examined. **La Gomera:** 3♂, 2♀, nr El Cedro, 28°7'30"N, 17°14'W, 950 m, 14 July 1997 (DP 71). 1♀, rd Hermigua to Monte del Cedro, 28°07'16"N, 17°12'30"W, 700–1000 m, 25 May 1998 (DP 219). 36♂, 32♀, Ermita de las Nieves, 28°06'30"N 17°11'W, ca 1000 m, 30 July 2000 (DP 344). 25♂, 41♀, 10 nymphs, Roque Agando, 28°06'N, 17°12'W, ca 1000 m, 31 July 2000 (DP 345).

Arytinnis hupalupa sp. n.
(figures 12, 13C–D, 20A)

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, sparse: less than 40 per 0.1 mm²; apical spines in wing cells cu₁, m₁ and m₂, but absent, or occasionally few present in cell r₂. Antennae short; genal cones very short. Genitalia elongate and slender. Male genitalia as in figure 12F–I; paramere apex small, positioned to the posterior of the top of the paramere, in dorsal view contiguous anteriorly or along inner margin (figure 13C, D); aedeagus distal segment with a well-developed, curved hook, tip of aedeagus turning upwards; male subgenital plate dorsal profile raised anteriorly. Female genitalia as in figure 12E; proctiger dorsal profile more or less straight, or with slight post-anal depression.

Adult measurements and ratios. (3♂, 3♀) Total length: ♂ 2.6–2.84, ♀ 2.76–3.16; WL: ♂ 2.1–2.21, ♀ 2.35–2.38; HW: ♂ 0.66–0.72, ♀ 0.72–0.74; AL: 1.31–1.47; GC: 0.05–0.1; PB: 0.12–0.14. WLPT: 2.75–3.26; GCVL: 0.31–0.5; VLW: 0.41–0.48; WLW: 2.41–2.59; CUR: 1.61–1.93; MR: 0.45–0.49; TLFL: 1.13–1.2. Adult genitalia ♂: MP: 0.32–0.35; PL: 0.56; AEL: 0.32–0.33; MSLH: 1.31–1.47; AHS: 0.27–0.28; PLSH: 1.6–1.75. ♀: FP: 0.89–0.93; FSP: 0.56; RL: 0.17–0.2; OV: 0.2–0.21; EL: 0.18–0.26.

Nymph

Colour. First to second instars cream and orange, some with black tergites, 3rd–5th instars pale yellow or green with black tergites.

Fifth instar structure. Antennal segments seven.

Fifth instar measurements. (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; HW: 0.59–0.62; AL: 0.75–0.82.

Fifth instar chaetotaxy. Head setae simple; ocular seta simple, inconspicuous; primary post-ocular seta narrowly or distinctly capitate; secondary post-ocular seta simple. Dorsal thoracic setae short simple. Forewing pad with one apical macroseta, simple or narrowly capitate; hindwing pad with one apical macroseta, distinctly or narrowly capitate, paired with small simple seta; proximal setae indistinct from simple microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae absent or present on anterior tergites, short simple, caudal plate macrosetae absent (numerous small simple); sectasetae four pairs; marginal abdominal

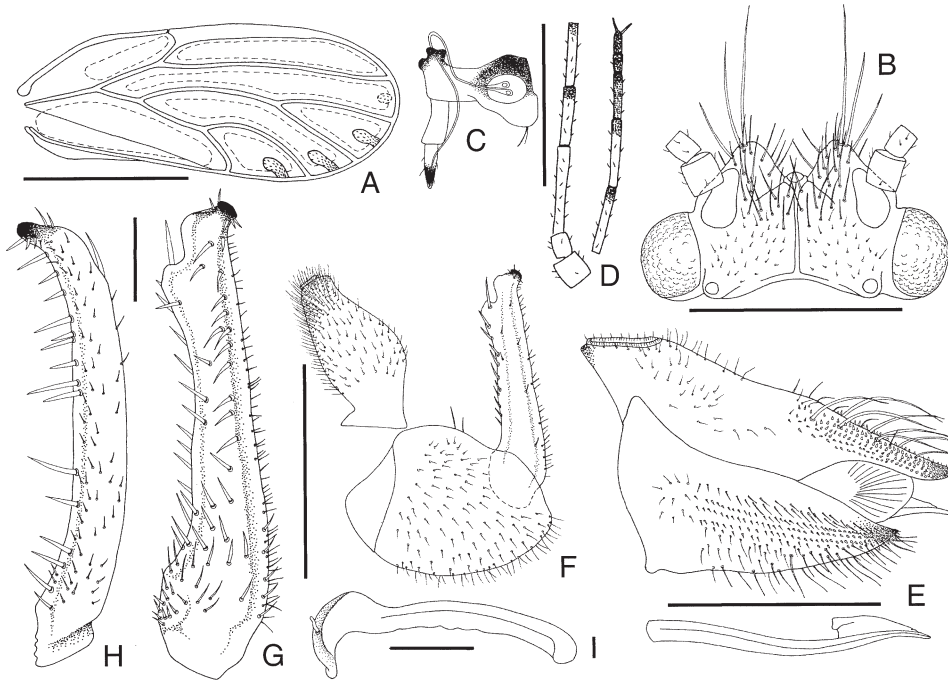


FIG. 12. Adult *Arytinnis hupalupa* sp. n. (A–I) as figure 3.

setae (other than sectasetae) three pairs, distinctly capitate (fourth small simple, or occasionally small capitate); pleurite setae typically paired simple, or simple with short capitate. Foreleg without capitate setae; middle leg without capitate setae or one on tibia (distal, or occasionally small capitate proximally); hind leg capitate setae (often narrow) on femur and tibia or tibia only—one or two (one larger distally, and typically one smaller proximally).

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

Distribution. Canary Islands: La Gomera.

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

Biology. Small nymphs (1st–2nd 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 figure 13). 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 May 1998 (BMNH). Paratypes 75♂, 70♀, 38 nymphs, as for holotype (BMNH). 2♂, 3♀, 4 nymphs, as for holotype (DZUL). 3♂, 2♀, 5 nymphs, as for holotype (NHMB).

Other material examined. **La Gomera:** 2♂, 4♀, nr El Cedro, 28°7'30"N, 17°14'W, 950 m, 14 July 1997 (DP 71). 1♀, Ermita de las Nieves, 28°06'30"N, 17°11'W, ca 1000 m, 30 July 2000 (DP 344). 1♀, Roque Agando, 28°06'N, 17°12'W, ca 1000 m, 31 July 2000 (DP 345).

Arytinnis modica (Loginova) comb. n.
(figures 13A, B, 20B)

Arytainilla modica Loginova, 1976: 23; Hodkinson and Hollis, 1987: 42.

Adult

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

Description. Loginova (1976).

Nymph

Colour. First to second instars orange or cream, some with black tergites, 4th–5th instars pale green or yellow.

Fifth instar structure. Antennal segments seven.

Fifth instar measurements. (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; HW: 0.61–0.69; AL: 0.88–1.08.

Fifth instar chaetotaxy. Head setae simple; ocular seta simple, inconspicuous; primary and secondary post-ocular setae simple or narrowly capitate. Dorsal thoracic setae short simple. Forewing and hindwing pads each with one apical macroseta, distinctly or narrowly capitate, on the hindwing pad paired with smaller simple seta; proximal setae if present simple, sometimes indistinct from simple surface microsetae. Dorsal abdominal pre-caudal macrosetae absent or present on anterior tergites, short simple, caudal plate macrosetae absent (numerous small simple); sectasetae four pairs; marginal abdominal setae (other than sectasetae) three or four pairs (fourth sometimes reduced or simple), distinctly capitate; pleurite setae paired capitate and simple. Foreleg without capitate setae; middle leg capitate setae on tibia, two (one proximal, one larger distal); hind leg capitate setae on femur and tibia, on tibia two or three (one or two proximal, one 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. n. 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 (1st–2nd 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 and La Palma. This evolutionary scenario and the genetic variation in these host races are currently being investigated in a molecular analysis.

Material examined. **Canary Islands, La Palma:** 3♂, 2♀, 1 nymph, SE rd Santa Cruz to La Caldera, 28°43'N, 17°46'W, 930 m, ex *Teline stenopetala*, 15 July 1997 (DP 73). 5♂, 1♀, rd to La Cumbrecita, 28°39'30"N, 17°50'45"W, ca 900 m, ex

Chamaecyctisus proliferus, 16 May 1998 (DP 189). 13♂, 16♀, 4 nymphs, Los Tilos, Barranco del Agua, 28°47'30"N, 17°47'45"W, ca 500 m, ex *Teline stenopetala*, 17 May 1998 (DP 192). 49♂, 26♀, 9 nymphs, NW rd from Llano Negro to La Caldera, 28°48'N, 17°55'30"W, ca 1050 m, ex *Chamaecyctisus proliferus*, 19 May 1998 (DP 201). **El Hierro**: Holotype ♂ (dry mounted) and 5♂♀ paratypes, Guarasoca, 26 March 1950, H. Lindberg (ZMH). 4♂, 2♀, between Mirador de la Peña and Mirador Jinama, 27°47'30"N, 17°58'W, 900–960 m, ex *Teline stenopetala*, 12 July 1997 (DP 63). 6 nymphs, as for previous except, 27°48'N, 17°58'W, 860 m, ex *Chamaecyctisus proliferus* (DP 64). 89♂, 56♀, 3 km W of San Andres, 27°45'30"N, 17°58'30"W, 1250 m, ex *Chamaecyctisus proliferus*, 22 May 1998 (DP 210). 33♂, 28♀, 11 nymphs, El Golfo, rd to Frontera, 27°44'N, 18°01'30"W, 1100 m, ex *Teline stenopetala*, 22 May 1998 (DP 212).

Arytainilla dividens (Loginova) comb. n.
(figures 13E, F, 20C, 23B)

Arytainilla dividens Loginova, 1976: 21; Hodkinson and Hollis, 1987: 42.

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.

Description. Loginova (1976).

Nymph

Colour. First to third instars cream or orange, with black tergites, 4th–5th instars pale green or blue-grey, with or without black tergites.

Fifth instar structure. Antennal segments seven.

Fifth instar measurements. (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; HW: 0.7–0.94; AL: 1–1.24.

Fifth instar chaetotaxy. Head setae simple; ocular seta simple, more or less inconspicuous; primary and secondary post-ocular setae simple, narrowly or distinctly capitate. Dorsal thoracic setae short and long simple, occasionally narrowly capitate. Forewing pad macrosetae two, marginal (one apical, one proximal, with numerous shorter simple setae on the outer margin) apical seta narrowly or distinctly capitate; hindwing pad macrosetae two, marginal (one apical, one proximal) apical seta distinctly capitate, paired with small simple seta; proximal setae simple, narrowly or distinctly capitate; simple microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, occasionally few on posterior tergites, long simple and capitate, caudal plate macrosetae two to four, distinctly capitate; sectasetae three or four pairs (first pair may be reduced or simple); marginal abdominal setae (other than sectasetae) three or four pairs (fourth frequently reduced or simple), distinctly capitate; pleurite setae paired capitate and simple. Foreleg without capitate setae (occasionally one proximally on the tibia); middle leg capitate setae on femur and tibia or tibia only—two to four (two larger and two small); hind leg capitate setae on femur and tibia or tibia only—five to seven.

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

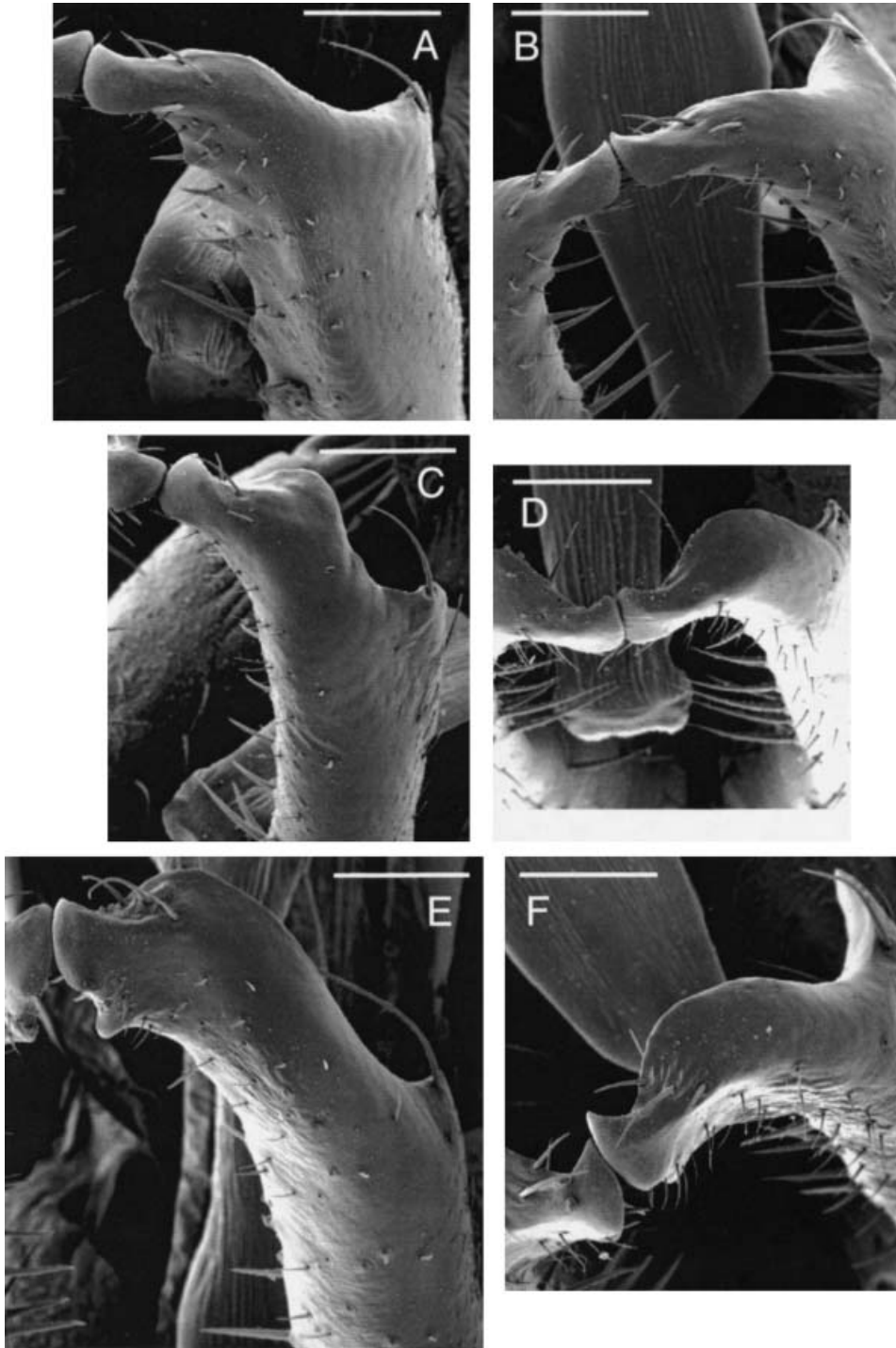


FIG. 13. SEM. ♂ parameres in lateral and dorsal views: (A, B) *Arytinnis modica*; (C, D) *A. hupalupa* sp. n.; (E, F) *A. dividens* (scale bars = 50 μ m).

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 any one host type.

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, first instar nymphs on hatching migrate down into the bud to feed on the younger leaves (figure 23B). Eggs were also found singly, scattered on the surface of fruit. Small nymphs (1st–2nd instars) were observed on leaf buds, and (1st–5th instars) were observed at the base of fruit, beneath the persistent calyx.

Comment. One ♂ was recorded from La Palma by Loginova (1976) but this distribution has not been corroborated during this study.

Material examined. **Canary Islands, Gran Canaria:** 14♂, 15♀, 42 nymphs, rd San Bartolomé de Tirajana to Fataga, 27°54'30"N, 15°34'30"W, 920 m, 16 April 1998 (DP 161). 10♂, 7♀, 17 nymphs, Barranco de Mogán, above Mogán, 27°54'30"N, 15°42'30"W, ca 500 m, 18 April 1998 (DP 167). 61♂, 6♀, 28 nymphs, NE of Tejada, 27°59'30"N, 15°35'W, 1300 m, 19 April 1998 (DP 168). **Tenerife:** 10♂♀, Teide, Rte C823, 10 May 1987, D. Hollis (BMNH). 5♂, 2♀, 3 nymphs, Miradores de la Cumbre, 28°23'30"N, 16°26'W, 1800 m, 22 June 1997 (DP 6). 41♂, 37♀, 81 nymphs, rd Buenavista to Santiago del Teide, N of turning to Los Carrizales, 28°19'N, 16°50'30"W, 900 m, 28 June 1997 (DP 20). 3♂, 11♀, 29 nymphs, rd El Teide to Arafo 28°23'N, 16°25'W, 1250 m, 9 July 1997 (DP 53). 10♂, 9♀, 5 nymphs, N of Vilaflor, 28°10'30"N, 16°39'W, c. 1900 m, 10 May 1998 (DP 188). **La Gomera:** 65♂, 53♀, 43 nymphs, rd Arure to Las Hayas, 28°7'30"N, 17°18'30"W, 900 m, 13 July 1997 (DP 68). 36♂, 23♀, 24 nymphs, La Laguna Grande, 28°06'30"N, 17°16'W, ca 1300 m, 26 May 1998 (DP 224).

Arytinnis umbonata (Loginova) comb. n.
(figure 21A)

Arytainilla umbonata Loginova, 1976: 30; Hodkinson and Hollis, 1987: 42.

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.

Description. Loginova (1976).

Nymph

Colour. First and third instars cream and orange, 4th–5th instars green or yellow with pink abdomens, with or without black tergites.

Fifth instar structure. Antennal segments seven.

Fifth instar measurements. (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; HW: 0.61–0.68; AL: 0.95–1.07.

Fifth instar chaetotaxy. Head setae simple; ocular seta simple, inconspicuous, occasionally longer and darker; primary and secondary post-ocular setae narrowly

or distinctly capitate. Dorsal thoracic setae short simple and long capitate. Forewing pad macrosetae 8–10, distinctly capitate, marginal (seven to nine outer margin, one proximal); hindwing pad macrosetae distinctly capitate, one or two marginal (one apical, one proximal), apical seta paired with small simple seta; proximal setae simple, narrowly or distinctly capitate; simple microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, long simple and capitate, caudal plate macrosetae absent; sectasetae three pairs (occasionally reduced fourth pair present); marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate; pleurite setae paired capitate and simple. Legs with simple setae only.

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 (1st–5th instars) observed on the calyx and corolla, and inside the flower on the styler column.

Comment. Although the form of the adult genitalia is distinct, the 5th 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, Levada do Furado, W of Balcões, 900 m, 30 June 1998 (DP 268). 12♂, 15♀, 7 nymphs, just N of Ribeira Brava, ca 100 m, 1 July 1998 (DP 270). 15♂, 17♀, 3 nymphs, Pico do Gato, ca 1500 m, 2 July 1998 (DP 272). 26♂, 23♀, 17 nymphs, Encumeada, path to Pico Ruivo, ca 1050 m, 3 July 1998 (DP 273.1).

Arytainilla incuba (Loginova) comb. n.
(figure 21C)

Arytainilla incuba Loginova, 1976: 28; Hodkinson and Hollis, 1987: 42.

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.

Description. Loginova (1976).

Nymph

Colour. First to third instars cream and orange, 4th–5th instars yellow-green or blue-green, with or without black tergites.

Fifth instar structure. Antennal segments seven.

Fifth instar measurements. (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; HW: 0.68–0.73; AL: 1.18–1.22.

Fifth instar chaetotaxy. Head setae simple and narrowly capitate (mostly simple anteriorly and capitate posteriorly); ocular seta simple, dark, conspicuous; primary and secondary post-ocular setae distinctly capitate. Dorsal thoracic setae long capitate with short or minute simple. Forewing pad macrosetae 8–10, distinctly capitate, marginal (seven to nine outer margin, one proximal); hindwing pad macrosetae two, distinctly capitate, marginal (one apical, one proximal), apical seta paired with small simple seta; proximal setae distinctly capitate (rarely simple); simple or occasionally

capitate or rod microsetae on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, long capitate, caudal plate macrosetae typically absent, or two, distinctly capitate; sectasetae three pairs; marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate; pleurite setae paired capitate and simple. Legs with simple setae only.

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 (1st–2nd 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, Levada do Furado, W of Balcões, 900 m, 30 June 1998 (DP 267). 31♂, 15♀, 6 nymphs, Porto do Moniz, Levada da Central da Ribeira da Janela, 400 m, 1 July 1998 (DP 271). 17♂, 11♀, 16 nymphs, W of Encumeada, 1100 m, 3 July 1998 (DP 274). 16♂, 9♀, 6 nymphs, Encumeada, Levada do Norte, 1000 m, 3 July 1998 (DP 276).

Arytinnis hakani (Loginova) comb. n.

Arytainilla hakani Loginova, 1972: 21; Hodkinson and Hollis, 1987: 42; Rapisarda, 1987: 66.

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

Adult and nymphal descriptions. Loginova (adult, 1972), Rapisarda (5th instar nymph, 1987).

Nymphal colour. Fourth to fifth 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. n. It is recorded from the western Mediterranean as far east as Algeria (Burckhardt 1989) and southern Italy (Conci *et al.*, 1993); the host plant distribution, however, extends further east to Syria (Gibbs and Dingwall, 1972).

Comment. Both adult and 5th instar nymph are extremely similar to the Madeiran species, *A. incuba*, and these two species may represent recent disjunction and diversification.

Material examined. **Morocco:** 28♂, 16♀, 3 nymphs, Western Rif Mountains, W of Bab-Taza, 35°10'N, 5°20'W, ca 1000 m, 29 March 1998 (DP 146). 24♂, 23♀, Western Rif Mountains, E of Bab Berret, 34°56'N, 4°50'W, ca 1400 m, 22 June 1998 (DP 256). **Spain:** 20♂♀, Gerona, 9 km La Bisbal-Calogne rd, 1 June 1975, D. Hollis (BMNH). 12♂, 15♀, 8 nymphs, Andalusia, Parque Natural de los Alcornocales, 36°15'N, 5°37'W, ca 300 m, 25 December 1997 (DP 118). 38♂, 23♀, 21 nymphs, Andalusia, ca 10 km S of Ubrique, 36°35'N, 5°30'W, ca 600–700 m, 24 March 1998 (DP 143).

Arytinnis cognata (Loginova) comb. n.
(figure 21B)

Arytainilla cognata Loginova, 1972: 22; Hodkinson and Hollis, 1987: 42.

Adult

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

Descriptions. Loginova (1972, 1977).

Nymph

Colour. Fifth instars bright green to blue-green or yellow-orange, with black tergites.

Fifth instar structure. Antennal segments seven.

Fifth instar measurements: (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; HW: 0.62–0.74; AL: 0.91–0.99.

Fifth instar chaetotaxy. Head setae simple; ocular seta simple, inconspicuous; primary and secondary post-ocular setae simple or narrowly capitate. Dorsal thoracic setae short simple. Forewing pad macrosetae four to seven, simple or distinctly capitate, marginal (one apical seta capitate or simple, remainder simple); hindwing pad macrosetae two, simple or distinctly capitate, marginal (one apical, one proximal), apical seta paired with small simple seta; proximal setae simple (sometimes indistinct); simple microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, long simple, caudal plate macrosetae absent or four to seven simple (sometimes with one centrally and posteriorly placed); sectasetae four pairs; marginal abdominal setae (other than sectasetae) three or four pairs (fourth frequently reduced), simple, narrowly or distinctly capitate; pleurite setae paired simple (distal sometimes slightly capitate). Legs with simple setae only.

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:** 20♂♀, High Atlas, SW Imlil El Haj, 28 April 1961, P. N. Lawrence (BMNH). 44♂, 40♀, 10 nymphs, High Atlas, north of Tizi n' Test pass, 30°50'N, 8°30'W, ca 2080 m, 19 June 1998 (DP 238). 3♂, 5♀, 3 nymphs, High Atlas, rd to Oukaïmeden, Vallée de l'Ourika, 31°10'N, 7°45'W, ca 2000 m, 1 May 1999 (DP 324). 22♂, 29♀, 9n, High Atlas, ca 2 km below Oukaïmeden, Vallée de l'Ourika, 31°08'N, 7°40'W, ca 2600 m, 1 May 1999 (DP 325.1). 6♂, 3♀, High Atlas, S of Tizi n' Test, 30°50'N, 8°28'W, ca 2000 m, 2 May 1999 (DP 329).

Arytinnis berber sp. n. (13)
(figures 14, 21D)

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, sparse: less than 40 per 0.1 mm²; apical spines in wing cells cu₁, m₁

and m_2 , but absent, or occasionally few present in cell r_2 . Antennae short; genal cones very short. Male genitalia as in figure 14F–I; paramere apex in dorsal view contiguous anteriorly with inner margin straight edged. Female genitalia as in figure 14E.

Adult measurements and ratios. (3♂, 2♀) Total length: ♂ 2.52–2.6, ♀ 2.84; WL: ♂ 1.95–2.16, ♀ 2.24–2.3; HW: ♂ 0.66–0.7, ♀ 0.69–0.72; AL: 1.22–1.31; GC: 0.06–0.1; PB: 0.14–0.16. WLPT: 3.48–3.77; GCVL: 0.33–0.53; VLW: 0.45–0.5; WLW: 2.29–2.38; CUR: 1.47–1.76; MR: 0.48–0.6; TLFL: 1.14–1.18. Adult genitalia ♂: MP: 0.22–0.23; PL: 0.33–0.34; AEL: 0.23–0.24; MSLH: 1.19–1.36; AHS: 0.31–0.33; PLSH: 1.27–1.36. ♀: 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.

Nymph

Colour. Fifth instars orange-yellow.

Fifth instar structure. Antennal segments seven.

Fifth instar measurements: (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; HW: 0.54–0.57; AL: 0.77–0.8.

Fifth instar chaetotaxy. Head setae simple; ocular seta simple or narrowly capitate, dark, conspicuous; primary and secondary post-ocular setae distinctly capitate. Dorsal thoracic setae short simple and long, stout capitate. Forewing pad macrosetae three to seven, distinctly capitate, marginal, proximal seta distinctly capitate or rarely indistinct; hindwing pad macrosetae two or three, simple or distinctly capitate, marginal (one or two apical, one proximal), proximal seta simple or distinctly capitate, apical seta paired with small capitate or small simple seta;

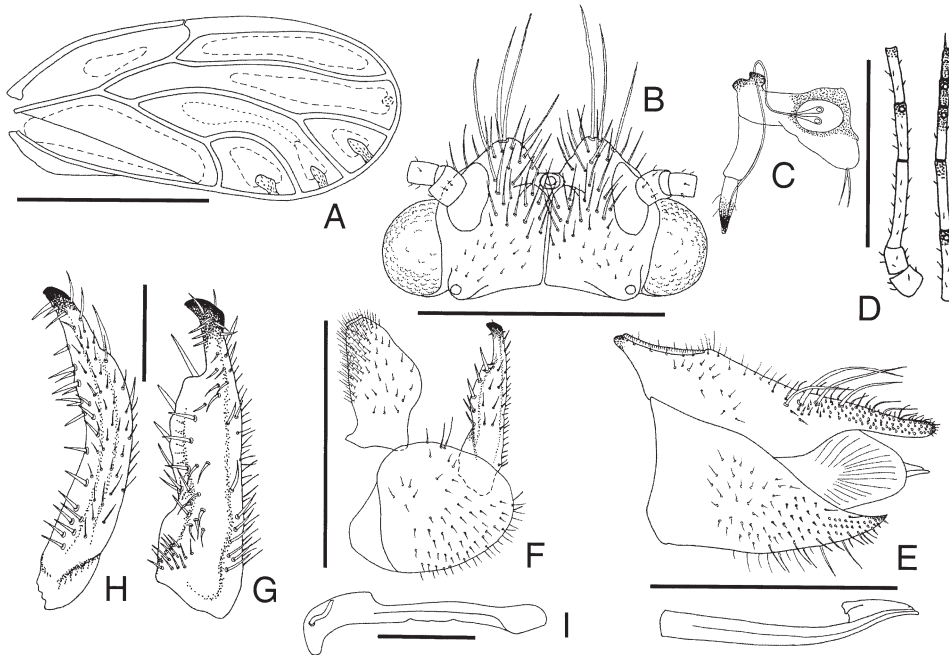


FIG. 14. Adult *Arytinnis berber* sp. n. (A–I) as figure 3.

simple microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, long capitate, caudal plate macrosetae absent; sectasetae four pairs; marginal abdominal setae (other than sectasetae) three pairs, distinctly capitate; pleurite setae paired simple or paired capitate and simple. Legs with simple setae only.

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, below Tagudicht Aitsmaon, 29°42'N, 9°05'W, ca 1500 m, 3 May 1999 (BMNH). Paratypes 7♂, 2♀, 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 March 1999 (DP 302).

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.

Fifth instar 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.

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 fifth instar nymphs. The two larger species, *A. nubivaga* and *A. vittata* sp. n., are most similar to *A. genistae* in general body and wing coloration, 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 × width, widest in the apical third with a broadly rounded apex, veins and apical cells (cu₁, m₁ and m₂) with small dark patches at the margin of the wing; hindwing costal margin slightly concave, not darkly pigmented; antennae shorter than 1.9 mm; genal cones short (<0.14 mm); male

- paramere apex with a single anteriorly and interiorly directed hook; hind leg tibia longer than the femur, tibia length $\geq 0.75 \times$ head width, apical and metatarsi relatively short, each about $0.25\text{--}0.35 \times$ tibia length (on *Chamaecytisus*; Gran Canaria, Tenerife, La Gomera, La Palma) *devia* Loginova
- Forewing long and narrow, length greater than $2.5 \times$ 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); genal cones long (>0.14 mm); male paramere apex with an interiorly directed double claw; hind leg tibia shorter than the femur, tibia length about $0.5 \times$ head width, apical and metatarsi long, each about $0.5 \times$ tibia length (figure 2D, F) 2
- 2 Abdomen without dark, longitudinal dorsal stripe; male paramere shorter (<0.33 mm) and broader, length less than $0.9 \times$ subgenital plate height, interior medial ridge weakly developed and supporting relatively long setae (visible clearly only in posterior view) (on *Spartocytisus supranubius*; Tenerife) (figure 16B) *nubivaga* Loginova
- Abdomen with dark, longitudinal dorsal stripe (more distinct in females); male paramere longer (>0.33 mm) and narrower, length greater than $0.9 \times$ subgenital plate height, 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) (figures 15, 16A) *vittata* sp. n.

Key to 5th instars nymphs of the three Canary Island species of *Arytaina*

- 1 Antennae shorter than 1.1 mm; forewing pad shorter than 0.63 mm; dorsal thoracic setae short simple and long capitate; forewing and hindwing pads each with five or more capitate macrosetae on both wing pad surface and margins, proximal setae distinctly capitate; marginal abdominal pleurite setae paired capitate and simple; foreleg tibia with capitate setae present (on *Chamaecytisus*; Gran Canaria, Tenerife, La Gomera, La Palma) (figure 22B) *devia* Loginova
- Antennae longer than 1.1 mm; forewing pad longer than 0.63 mm; dorsal thoracic setae short simple; forewing and hindwing pads typically each with one or two capitate (occasionally simple) macrosetae on the wing pad margin, surface and proximal setae small simple; marginal abdominal pleurite setae paired simple; foreleg tibia without capitate setae 2
- 2 Abdominal sectasetae two pairs (in third and fourth positions); forewing pad length (>0.7 mm) greater than $0.87 \times$ head width; circumanal ring width less than $0.25 \times$ caudal plate width; dorsal caudal plate with six macrosetae; middle and hind tibiae each with more than two capitate setae (on *Spartocytisus supranubius*; Tenerife) (figure 22D) *nubivaga* Loginova
- Abdominal sectasetae one pair (in third position, apical pair small simple or rod setae); forewing pad length (<0.7 mm) less than $0.87 \times$ head width; circumanal ring width more than $0.25 \times$ caudal plate width; dorsal caudal plate with two macrosetae; middle and hind tibiae each with one capitate seta distally (on *Spartocytisus*; La Gomera, La Palma, El Hierro) (figure 22C) *vittata* sp. n.

Arytaina devia devia Loginova comb. rev.

Arytaina devia Loginova, 1976: 14.

Arytainilla devia (Loginova) Hodkinson and Hollis, 1987: 11, 42.

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.

Description. Loginova (1976).

Nymph

Colour. Fifth pale grey-green or blue green with black tergites; terminal antennal segment darker brown.

Fifth instar measurements: (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; HW: 0.66–0.77; AL: 0.93–1.02.

Fifth instar chaetotaxy. Head setae simple and narrowly capitate; antennal setae simple; ocular seta simple, dark, conspicuous; primary and secondary post-ocular setae distinctly capitate. Dorsal thoracic setae short simple and long capitate. Forewing pad macrosetae 9–14, distinctly capitate, surface and marginal (typically two to four surface setae with the remainder marginal); hindwing pad macrosetae five or six, distinctly capitate, surface and marginal; proximal setae distinctly capitate; simple microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, long capitate, caudal plate macrosetae, six, distinctly capitate; sectasetae absent; marginal abdominal setae (other than sectasetae) four pairs, distinctly capitate; pleurite setae paired capitate and simple. Legs with capitate setae present on femora and tibiae; foreleg with two capitate setae on tibia (one proximal, one distal); middle leg capitate setae on tibia four or five; hind leg capitate setae on tibia five or six.

Distribution. Canary Islands: Tenerife and La Gomera.

Material examined. **Canary Islands, Tenerife:** Holotype ♂ (dry mounted) and 19♂♀ paratypes, Teide, Cañadas, 20 May 1947, H. Lindberg (ZMH). 14♂, 16♀, 1 nymph, rd El Teide to Arafo 28°23'N, 16°25'W, 1250 m, 9 July 1997 (DP 53). 5♂, 6♀, 1 nymph, above Vilaflor, 28°10'30"N, 16°39'W, ca 1900 m, 10 May 1998 (DP 188). 1♂, 2♀, 20 nymphs, rd Granadilla de Abona to Vilaflor, 28°08'N, 16°37'W, <1000 m, 28 July 2000 (DP 342). **La Gomera:** 26♂, 30♀, 5 nymphs, rd Arure to Las Hayas, 28°7'30"N, 17°18'30"W, 900 m, 13 July 1997 (DP 68).

Arytaina devia insularis Loginova comb. rev.

(figure 22B)

Arytaina devia insularis Loginova, 1976: 16.

Arytainilla devia (Loginova) Hodkinson and Hollis, 1987: 11, 42.

Adult description. Loginova (1976).

Adult and nymph. Subspecies *insularis* shares the same coloration as ssp. *devia*. The primary difference in the adult is the more slender and elongate male paramere with a less pronounced basal posterior bulge. The 5th instar nymphs are similar to those of ssp. *devia*, with the notable exception of the Gran Canaria populations which have one pair of sectasetae in the third position and four dorsal caudal plate macrosetae; nymphs of ssp. *insularis* from La Palma are more similar to those of ssp. *devia* in the absence of sectasetae and the presence of six dorsal caudal plate macrosetae, they are also characterized by extremely long marginal abdominal capitate setae.

Distribution. Canary Islands: Gran Canaria and La Palma.

Comment. Loginova (1976) designated specimens from Gran Canaria and La Palma as ssp. *insularis*, and I have retained this rank, but since no type was published I have designated a lectotype below. Fifth instar nymphs from Gran Canaria can be separated from those of the other three islands by the presence of sectasetae, possibly suggesting a basal position for the Gran Canarian population in the colonization of the Canary Islands. The ontogeny of sectasetae in three species of *Arytaina* (*A. adenocarp*i, *A. devia* and *A. genistae*) shows a gradual reduction in number (four to zero or two) with progressively older instars.

Material examined. **Canary Islands, Gran Canaria:** 22♂, 23♀, 3 nymphs, rd San Bartolomé de Tirajana to Fataga, 27°54'30"N, 15°34'30"W, 920 m, 16 April 1998 (DP 161). 17♂, 19♀, 9 nymphs, Barranco de Mogán, above Mogán, 27°54'30"N, 15°42'30"W, ca 500 m, 18 April 1998 (DP 167). **La Palma:** Lectotype (here designated) ♂ (dry mounted) and 2♂ paralectotypes, El Paso, 26 May 1947, H. Lindberg (ZMH). 2♂, 13 nymphs, above Fuente de Olén, 28°44'N, 17°49'W, 1850 m, 16 July 1997 (DP 79). 22♂, 26♀, rd to La Cumbrecita, 28°39'30"N, 17°50'45"W, ca 900 m, 16 May 1998 (DP 189).

Host plant. *Chamaecytisus proliferus*, *Arytaina devia* spp. occur on all three recognized subspecies (Acebes Ginovés *et al.*, 1991).

Notes. *Arytaina devia* 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 infraspecific host taxa was detected.

Biology. Only a few large nymphs (5th instars) were found during April to May, when all of the smaller nymphs (1st–3rd 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 1st–5th instars were found on leaf buds, and eggs were found singly on the outer surface of young leaves. This suggests a different timing of development, as with other sympatric species, with *A. devia* developing later than either *A. dividens* or *A. modica*.

Comment. 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).

Arytaina nubivaga Loginova comb. rev.
(figures 16B, 22D)

Arytaina nubivaga Loginova, 1976: 12.

Arytainilla nubivaga (Loginova) Hodkinson and Hollis, 1987: 11, 42.

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.

Description. Loginova (1976).

Nymph

Colour. Fourth and fifth instars cream with black tergites. Sclerites, wing pads, legs and terminal antennal segments darker brown.

Fifth instar measurements: (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; HW: 0.77–0.81; AL: 1.18–1.23.

Fifth instar chaetotaxy. Head and antennal setae simple; ocular seta simple, conspicuous; primary and secondary post-ocular seta simple or narrowly capitate. Dorsal thoracic setae short simple. Forewing pad macrosetae two to five, simple or narrowly capitate, surface and marginal; hindwing pad macrosetae surface and marginal with two apical, distinctly or narrowly capitate; proximal setae absent (indistinct from surface microsetae in 5th instars, more prominent in 3rd and 4th instars); numerous simple microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, short simple with long simple and capitate (frequently narrow), caudal plate macrosetae six, narrowly or distinctly capitate; sectasetae two pairs; marginal abdominal setae (other than sectasetae) four pairs, narrowly or distinctly capitate (fourth pair sometimes simple); pleurite setae paired simple. Foreleg capitate setae on femur only; middle and hind leg capitate setae on femur and tibia, on tibia three (one large distal, one 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 calyx.

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:** 20♂♀, Las Cañadas, S side, 18 May 1987, D. Hollis (BMNH). 2♂, 6 nymphs, 12 km NE of Parque Nacional del Teide, 28°20'30"N, 16°29'W, 2080 m, 23 June 1997 (DP 7). 1♂, 2♀, 30 nymphs, 28°18'30"N, 16°33'W, 2–3 km NE of Parque Nacional del Teide, 2070 m, 23 June 1997 (DP 10). 17♂, 18♀, ca 2 km N of Observatory, Las Cañadas, 29°19'N, 16°29'30"W, ca 2200 m, 5 April 1998 (DP 154).

Arytaina vittata sp. n.

(figures 2D, F, 15, 16A, 22C, 23A)

Adult

Colour. Males generally darker than females, head and thorax brown or paler chesnut, 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_1 , but usually present, though often reduced, in other cells, sparse: less than 40 per 0.1 mm^2 ; apical spines in wing cells cu_1 , m_1 , m_2 , and few in cell r_2 ; hindwing costal margin markedly concave. Antennae long, with 10 segments; head not, or only weakly deflexed downwards with genal cones in approximately the same plane as the vertex; genal cones long, terminal setae typically shorter than the vertex. Distal proboscis segment short. Tibia shorter than the femur, tarsi long; metatarsal spur one. Male genitalia as in figure 15F–I; paramere with an internal medial ridge that, in posterior view, is almost contiguous when the parameres are closed (figure 16A); proctiger with a pronounced posterior extension apically; aedeagus distal segment with a well-developed, curved hook, tip of aedeagus hook acute. Female genitalia as in figure 15E; proctiger dorsal profile with a slight post-anal depression; eggs with a stout lateral pedicel.

Adult measurements and ratios. (5♂, 5♀) Total length: ♂ 3.32–3.88, ♀ 3.68–4.33; WL: ♂ 2.7–2.88, ♀ 3–3.2; HW: ♂ 1.01–1.03, ♀ 1.08–1.13; AL: 2.15–2.41; GC: 0.15–0.2; PB: 0.13–0.14. GCVL: 0.57–0.71; VLW: 0.45–0.5; WLW: 2.68–2.91; CUR: 1.65–2.03; MR: 0.41–0.52; TLFL: 0.84–0.91. Adult genitalia ♂: MP: 0.46–0.49; PL: 0.34–0.36; AEL: 0.33–0.37; MSLH: 1.25–1.4; AHS: 0.23–0.26; PLSH: 0.94–1.03. ♀: 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.

Nymph

Colour. First to second instars cream and orange or black, 3rd–5th instars cream and orange, pale yellow or blue-green, with black tergites. Sclerites, wing pads, legs and terminal antennal segments darker brown.

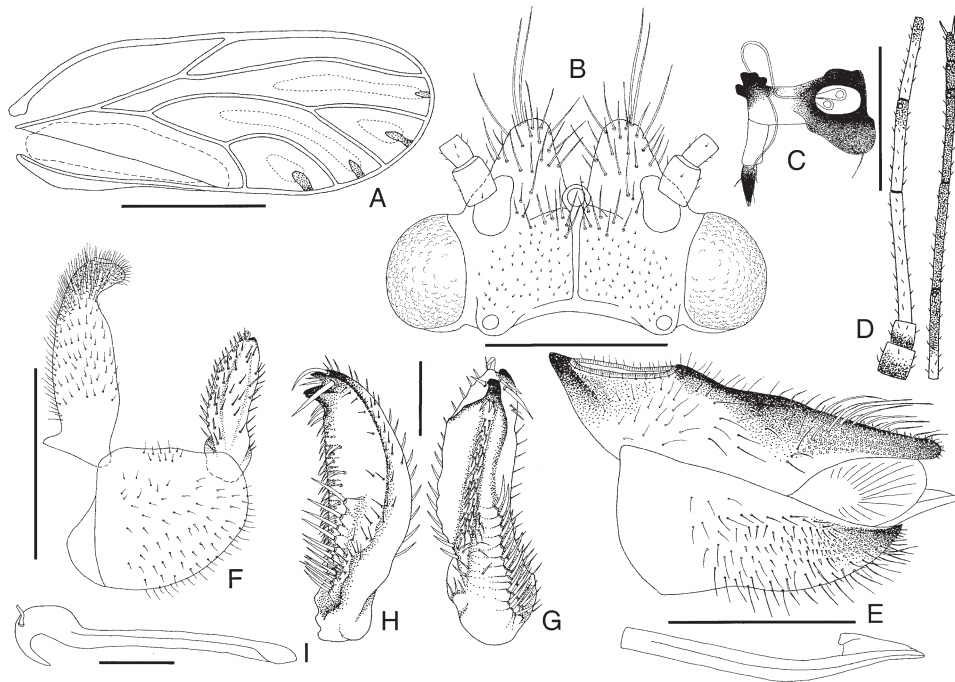


FIG. 15. Adult *Arytaina vittata* sp. n. (A–I) as figure 3.

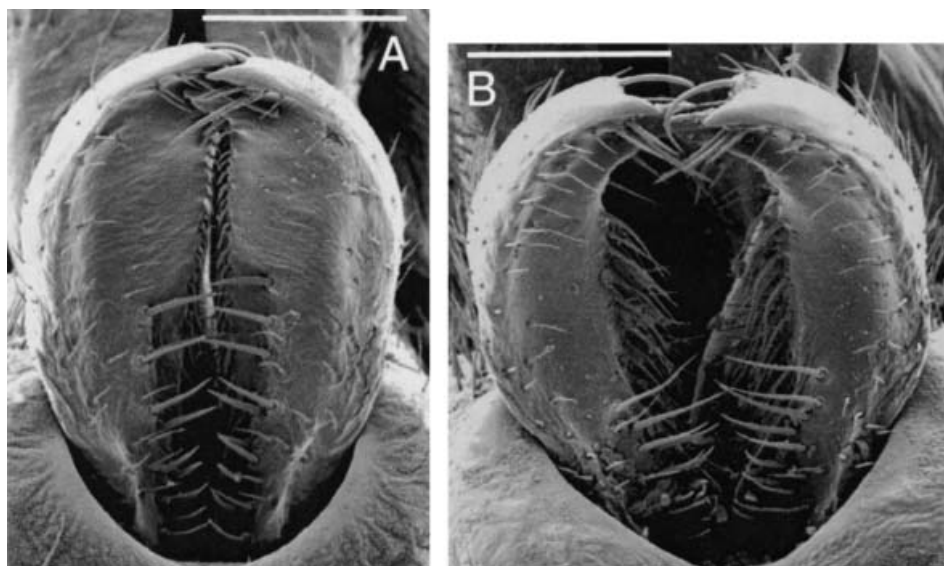


FIG. 16. SEM. ♂ parameres in posterior view: (A) *Arytaina vittata* sp. n.; (B) *A. nubivaga* (scale bars = 0.1 mm).

Fifth instar measurements. (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; HW: 0.79–0.9; AL: 1.18–1.28.

Fifth instar chaetotaxy. Head and antennal setae simple; ocular seta simple, inconspicuous; primary post-ocular seta simple or narrowly capitate; secondary post-ocular seta absent or simple. Dorsal thoracic setae short simple. Forewing pad with one apical macroseta, distinctly or narrowly capitate (occasionally reduced to small simple); hindwing pad with two apical macrosetae, distinctly capitate; proximal setae absent; simple microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, short simple (or very slightly capitate), caudal plate macrosetae two, narrowly capitate; sectasetae one pair in the third position (apical pair in the fourth position are small simple or rod setae); marginal abdominal setae (other than sectasetae) four pairs, distinctly capitate (fourth pair sometimes simple); pleurite setae paired simple. Foreleg without capitate setae; middle and hind leg capitate setae on femora and tibiae, on tibiae 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 (figure 23A). Of 46 flowers examined, 35 were found to have from 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 (1st–2nd 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 recognizable 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 the host switch occurred on one island, or was 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 adult coloration (i.e. dorsal vittae) and the 5th 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, ca 300 m, 18 May 1998 (BMNH). Paratypes 5♂, 53♀, 1 nymph, as for holotype (BMNH). 1♂, 1♀, as for holotype (DZUL). 1♀, as for holotype (NHMB). 1♀, SE rd Santa Cruz to La Caldera, 28°45'N, 17°49'30"W, 1950 m, ex *Spartocytisus supranubius*, 16 July 1997 (BMNH). **La Gomera:** 2♂, 2♀, S of Hermigua, 28°08'30"N, 17°12'W, 500–600 m, 25 May 1998 (BMNH). 3♂, 1♀, as for previous (NHMB). **El Hierro:** 5 nymphs, between Frontera and Sabinosa, 27°45'N, 18°04'W, 300 m, 22 May 1998 (BMNH).

Other material examined. (ex *Spartocytisus filipes* unless otherwise stated) **La Gomera:** 8♂, 10♀, above El Retamal, Valle Gran Rey, 28°7'N, 17°18'30"W, 550 m, 13 July 1997 (DP 66). 17♂, 16♀, 7 nymphs, rd Arure to Las Hayas, 28°7'30"N, 17°18'30"W, 900 m, 13 July 1997 (DP 69). 21♂, 14♀, S of Hermigua, 28°08'30"N, 17°12'W, 500–600 m, 25 May 1998 (DP 220). 2♂, 8♀, below Roque Cano, 28°11'N, 17°15'30"W, 300–400 m, 26 May 1998 (DP 222). **La Palma:** 1♀, SE rd Santa Cruz to La Caldera, 28°45'N, 17°49'30", 1950 m, ex *Spartocytisus supranubius*, 16 July 1997 (DP 80.1). 6♂, 23♀, Barranco de las Angustias, above Los Llanos 28°41'N, 17°53'30"W, 420 m, 17 July 1997 (DP 83). 3 nymphs, La Caldera, 28°46'N, 17°5'30"W, 2280 m, ex *Spartocytisus supranubius*, 17 July 1997 (DP 85). 1♀, nr Los Galguitos, Barranco de la Fuente, 28°46'N, 17°46'W, 350 m, 17 May 1998 (DP 191). 17♂, 15♀, Barranco de Jurado, S of Tijarafe, 28°42'15"N, 17°56'45"W, ca 600 m, 18 May 1998 (DP 197). 1♂, 15♀, between Barlovento and Roque Faro, 200–500 m, 19 May 1998 (DP 198). **El Hierro:** 12♂, 11♀, ca 5 km W of Frontera, 27°45'N, 18°03'30"W, 230 m, 10 July 1997 (DP 58). 27♂, 13♀, 13 nymphs, between Frontera and Sabinosa, 27°45'N, 18°04'W, 300 m, 22 May 1998 (DP 213).

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

(figures 2A, G, 22A)

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.

Description. Hodkinson (1990).

Nymph

Colour. First to second instars cream with black tergites, 3rd–4th instars orange-brown with black tergites, 5th instars pale blue-green or yellow with black tergites. Sclerites, wing pads, legs and terminal antennal segments darker brown.

Fifth instar 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.

Fifth instar measurements. (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; HW: 0.75–0.84; AL: 1.03–1.1.

Fifth instar chaetotaxy. Head setae simple and distinctly capitate; antennal setae simple and capitate (small capitate on first, and distally on third and fifth segments); ocular seta small, capitate; primary and secondary post-ocular seta distinctly capitate. Dorsal thoracic setae short capitate. Forewing macrosetae 8–12, distinctly capitate, surface and marginal (7–10 marginal, one proximal, remainder surface); hindwing macrosetae four to seven, distinctly capitate, surface and marginal (two apical, one proximal, one to four surface); proximal setae distinctly capitate; numerous capitate microsetae scattered on the wing pad surfaces. Dorsal abdominal pre-caudal macrosetae present on anterior tergites, short capitate, caudal plate macrosetae absent (numerous small capitate); sectasetae four pairs; marginal abdominal setae (other than sectasetae) four pairs, distinctly capitate; pleurite setae paired capitate and simple or capitate only (anterior pleurites with two or three capitate setae). Legs with capitate setae present on femora, tibiae and tarsi, on tibiae three or four 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* (Puton).

Material examined. **Canary Islands, Tenerife:** Holotype ♂ (slide mounted) and 5♂, 4♀ paratypes, 1 km N of Santiago, 18 December 1988, I. D. Hodkinson (BMNH). 45♂, 23♀ paratypes, Teno, Masca-Santiago del Teide rd, 16 May 1987, D. Hollis (BMNH). 3♂, 13♀, 3 nymphs, ca 2 km S of Tamaimo, 28°15'N, 16°48'30"W,

600 m, 29 June 1997 (DP 28). 6♂, 13♀, 5 nymphs, NW of Santiago del Teide, Barranco Seco, 28°18'30"N, 16°49'30"W, 1000 m, 2 July 1997 (DP 31). **La Gomera:** 15♂, 5♀, 3 nymphs, above El Retamal, Valle Gran Rey, 28°7'N, 17°18'30"W, 550 m, 13 July 1997 (DP 65). 66♂, 47♀, 1 nymph, rd Arure to Las Hayas, 28°7'30"N, 17°18'30"W, 900 m, 13 July 1997 (DP 70). **La Palma:** 4♂, 1♀, between Las Nieves and Mirca, 28°42'N, 17°46'30"W, 260 m, 16 July 1997 (DP 77). 11♂, 9♀, 6 nymphs, Barranco de las Angustias, 28°40'15"N, 17°55'45"W, 350 m, 18 May 1998 (DP 196). **El Hierro:** 22♂, 12♀, 16 nymphs, ca 50 m below Mirador de la Peña, 27°48'30"N, 17°59'W, 560 m, 12 July 1997 (DP 62).

General notes on biology

All eggs examined were smooth surfaced 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 (figure 23B). 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.

Parasitized 5th instar nymphs of three species, *A. proboscidea*, *A. occidentalis* sp. n. and *Livilla monospermae*, were collected in the field and parasitoids emerged after 1–2 weeks. All parasitoids were identified as Encyrtidae from the genera *Prionomitus*, *Pachyneuron* and *Trechnites* (J. Noyes, personal communication). 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.

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 *Arytimnis* gen. n. feed predominantly on hosts in the *Genista* group. However, all genera include species feeding on *Cytisus*, *Genista* and *Adenocarpus* groups. This suggests that certain constraints on host preference exist but these do not prohibit occasional switching between major host groups. 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. Within *Arytimnis* gen. n. only one species, *Arytimnis modica*, was found to feed sympatrically on 'unrelated' hosts, i.e. hosts from both *Cytisus* and *Genista* groups (table 1).

The diversity of *Arytimnis* gen. n. 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* (table 2). 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 rather than differences in dispersal or adaptability. For instance, the host genus *Retama* is represented by a single widespread species on all five of the western and central islands and this legume is host to a single psyllid species (*Livilla monospermae*)

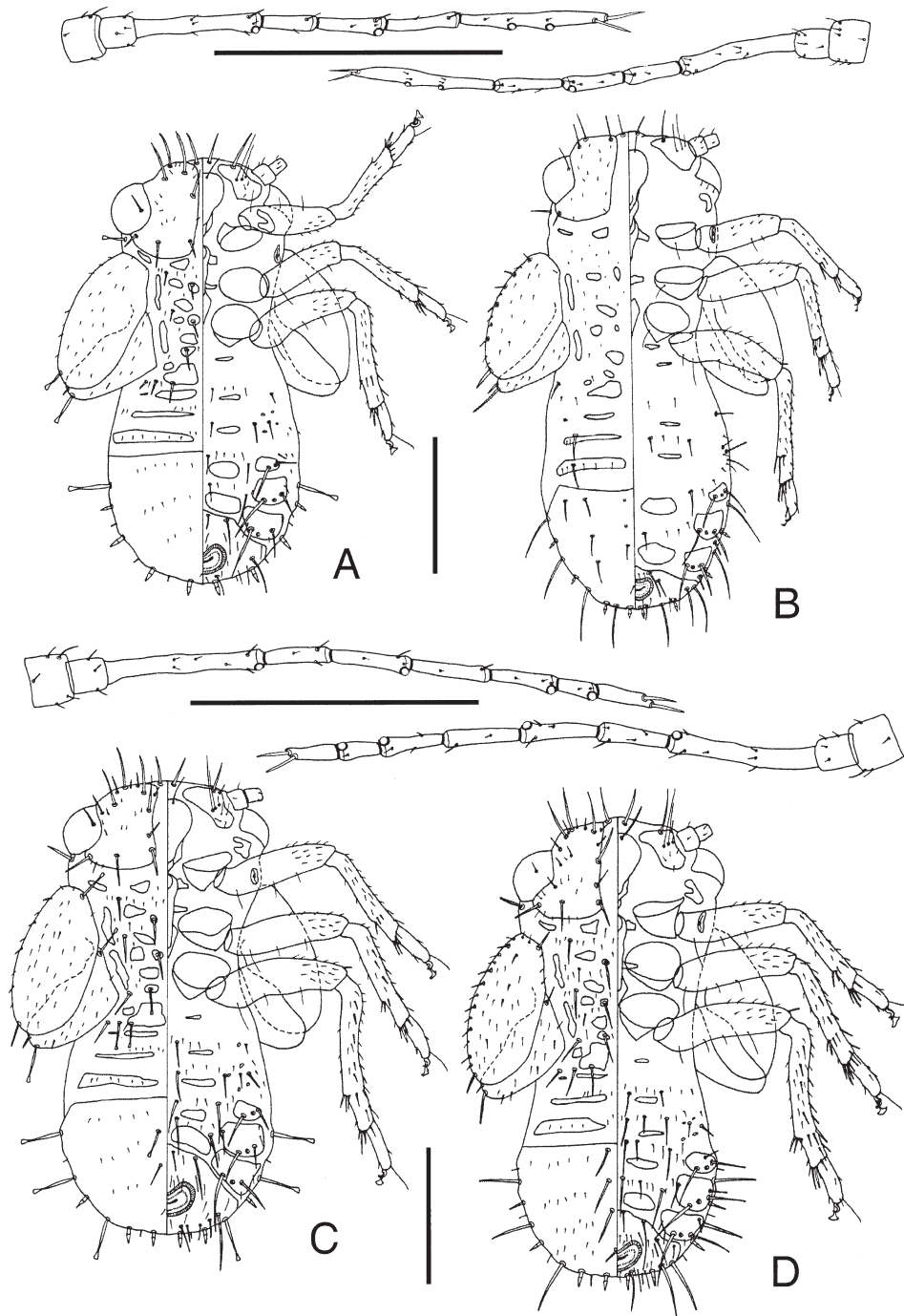


FIG. 17. Nymphs: (A) *Arytimis prognata*; (B) *A. diluta*; (C) *A. nigralineata*; (D) *A. proboscidea* (scale bars=0.5 mm).

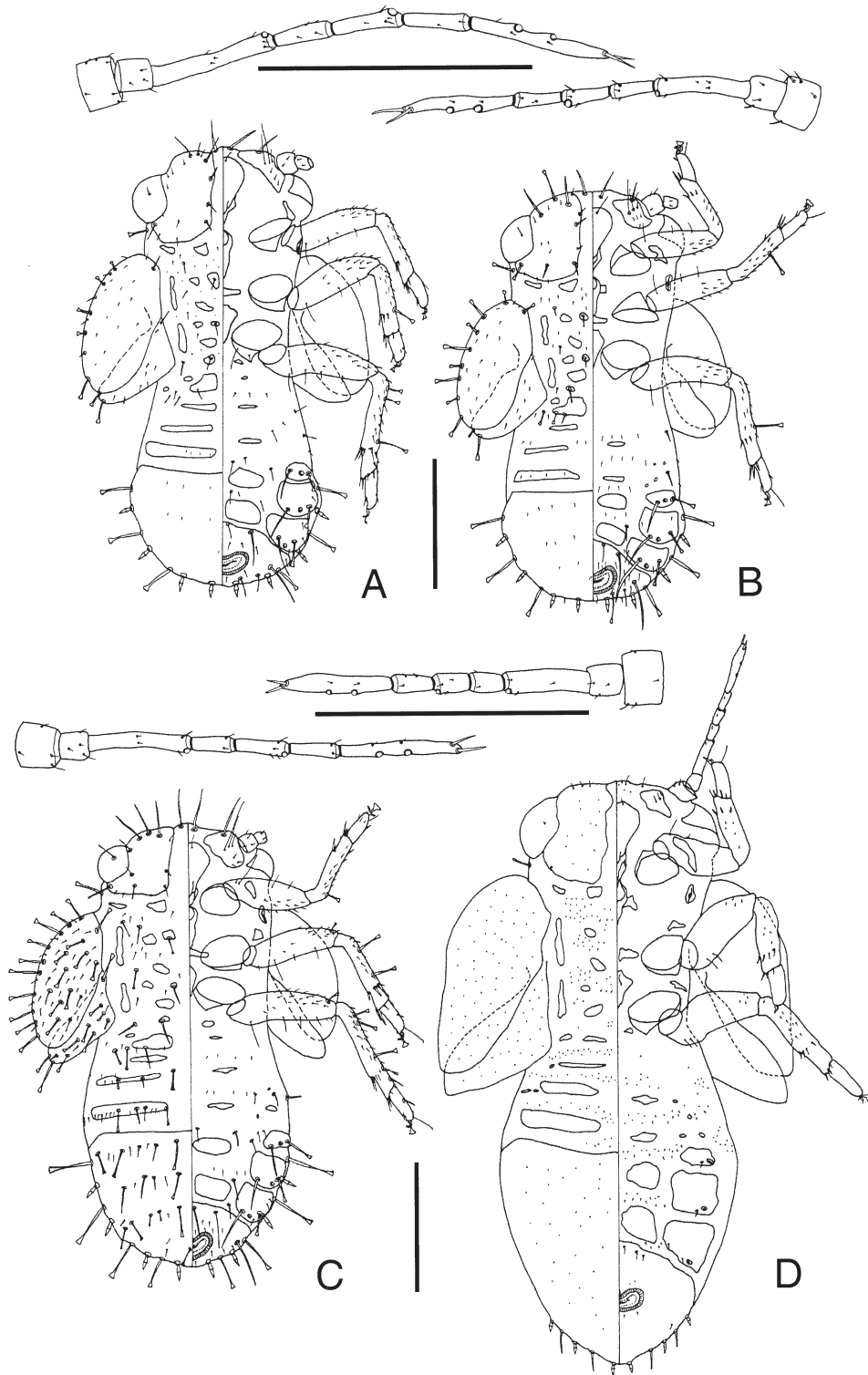


FIG. 18. Nymphs: (A) *Arytinnis fortunata* sp. n.; (B) *A. romeria* sp. n.; (C) *A. menceyata* sp. n.; (D) *Arytainilla serpentina* sp. n. (scale bars = 0.5 mm).

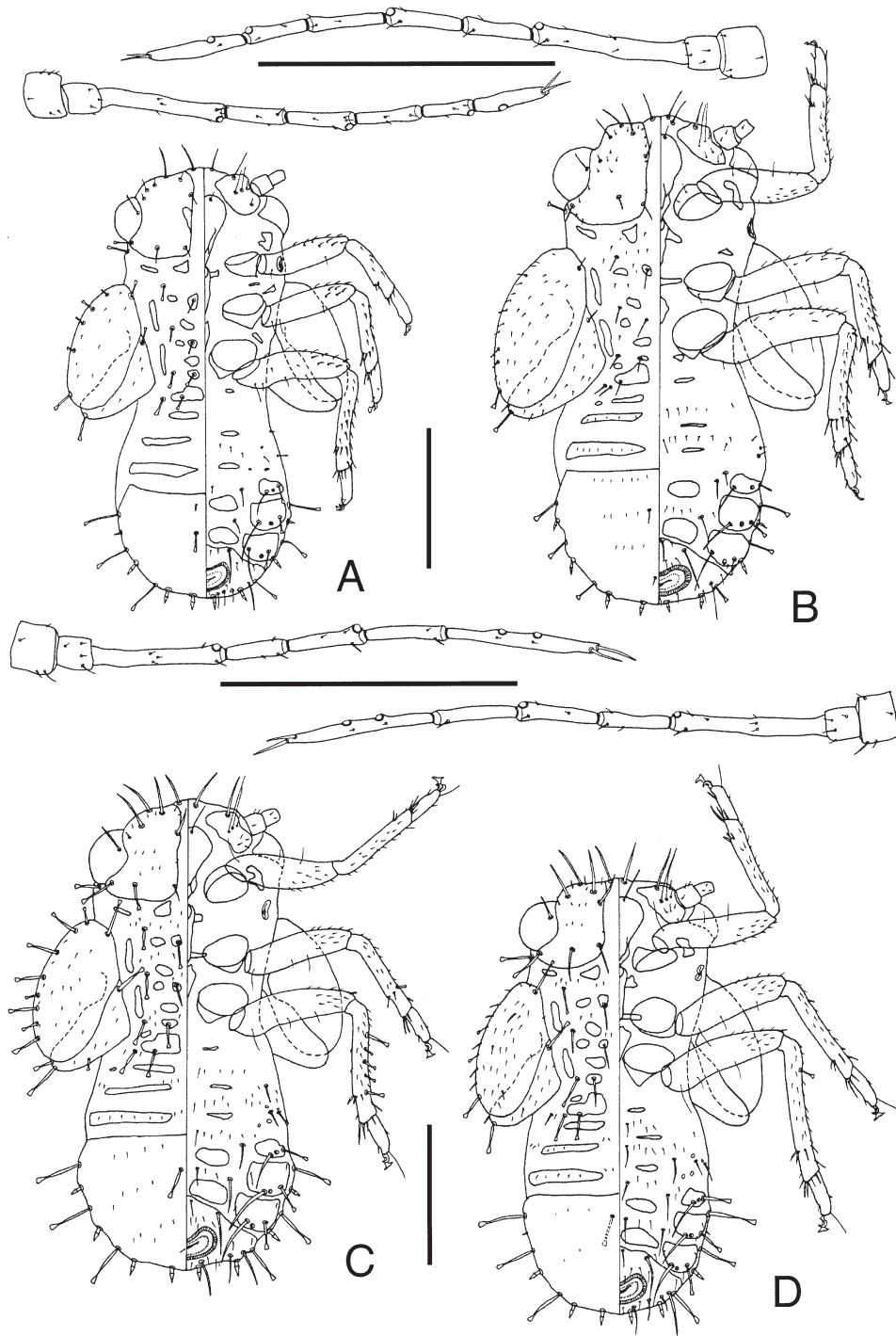


FIG. 19. Nymphs: (A) *Arytinnis gomerae* sp. n.; (B) *A. occidentalis* sp. n.; (C) *A. pileolata*; (D) *A. equitans* (scale bars=0.5 mm).

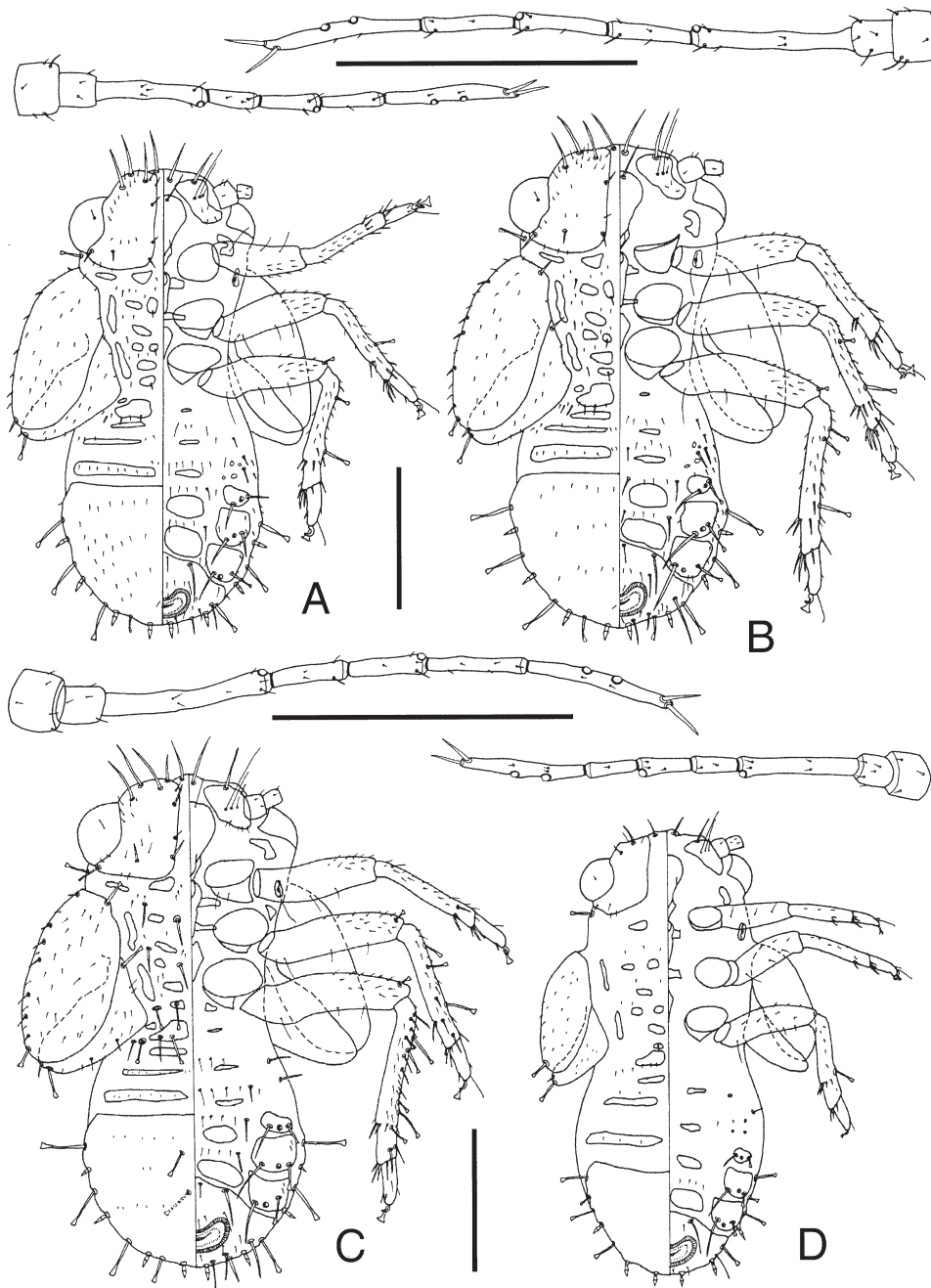


FIG. 20. Nymphs: (A) *Arytimis hupalupa* sp. n.; (B) *A. modica*; (C) *A. dividens*; (D) *A. ochrita* sp. n. (scale bars=0.5 mm).

present on four of the islands; 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

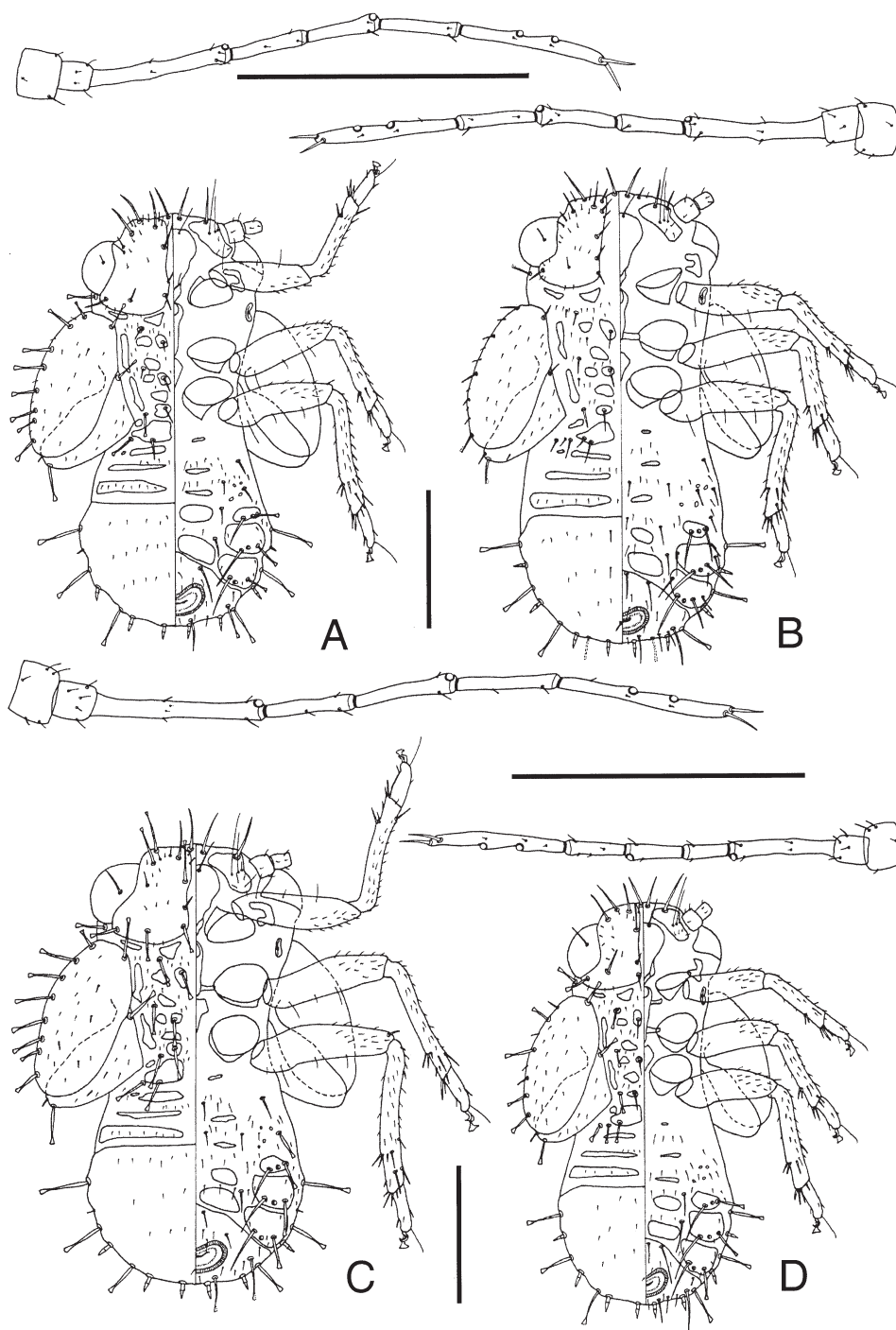


FIG. 21. Nymphs: (A) *Arytinnis umbonata*; (B) *A. cognata*; (C) *A. incuba*; (D) *A. berber* sp. n. (scale bars = 0.5 mm).

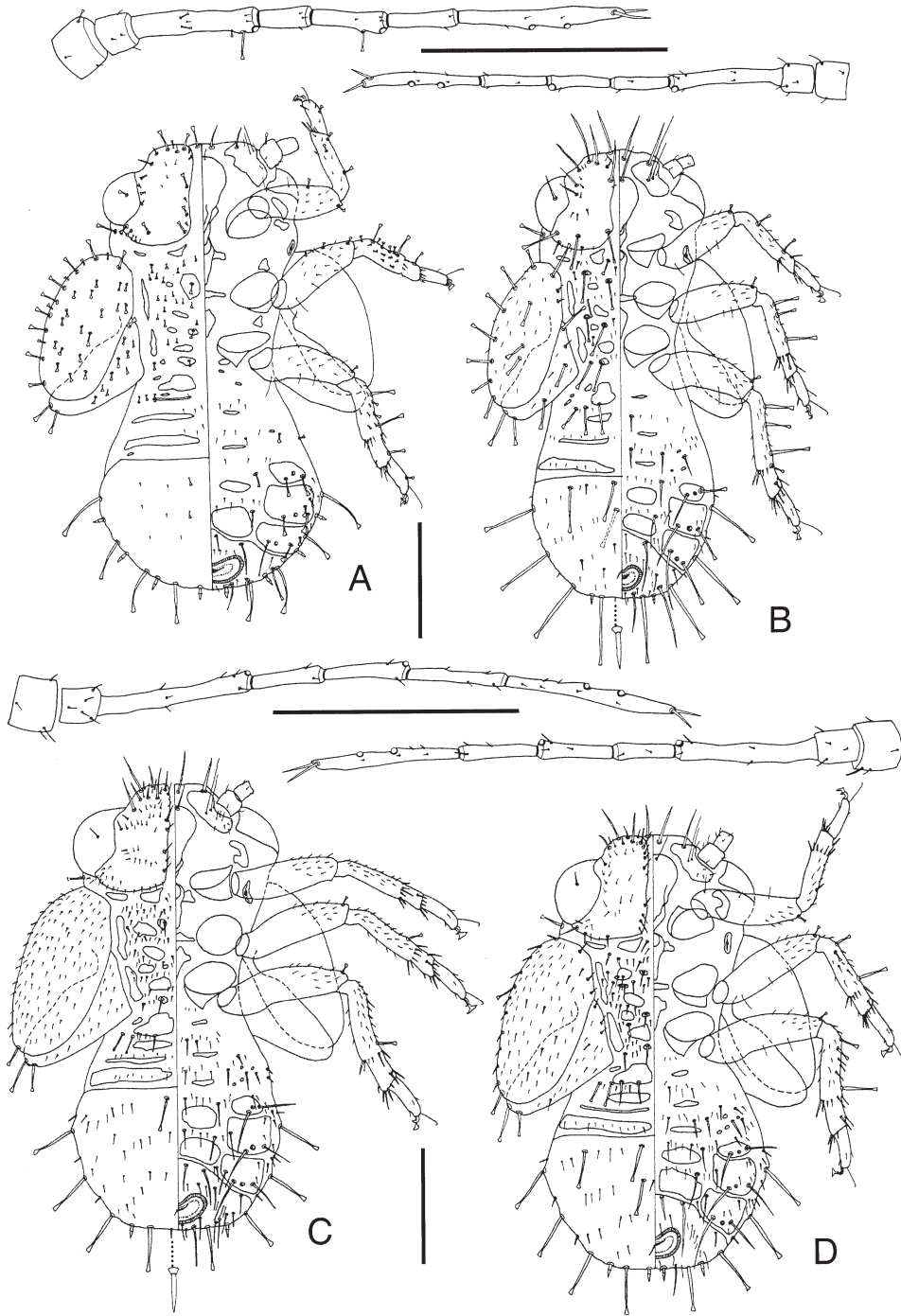


FIG. 22. Nymphs: (A) *Livilla monospermae*; (B) *Arytaina devia* (Gran Canaria); (C) *A. vittata* sp. n.; (D) *A. nubivaga* (scale bars = 0.5 mm).

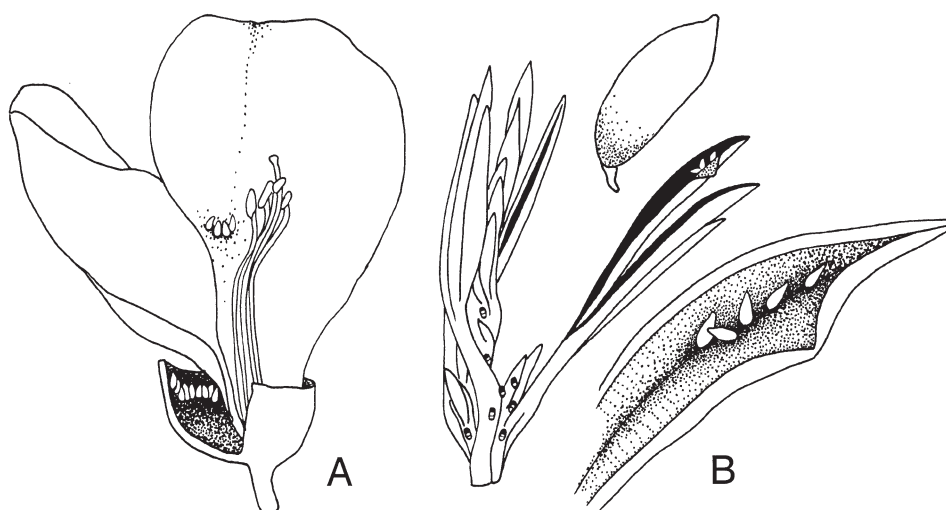


FIG. 23. Egg placement, (A) eggs of *Arytaina vittata* sp. n. are laid around the inner rim of the calyx, and in small clusters on the corolla of *Spartocytisus filipes*; (B) eggs of *Arytainilla dividens* are laid along the midrib, inside folded new leaves of *Chamaecytisus proliferus*, 1st–2nd instar nymphs then migrate down to feed on the leaf buds.

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 (multiple psyllids on a single host) and host switching appear to be common and may have been facilitated by host hybridization. Different timing in the development of 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 infraspecific taxa.

Acknowledgements

This work is part of a project funded by the Natural Environment Research Council (NERC GT04/97/109/TS). Additional funding for fieldwork was provided by the Carnegie Trust for the Universities of Scotland and the Louise Hiom Award (University of Glasgow) which together supported two expeditions to Morocco. I am grateful for permission to work and collect in the Canary Islands, received from Viceconsejería de Medio Ambiente (Gobierno Autónomo de Canarias), Parque Nacional del Teide (Tenerife), Parque Nacional de Garajonay (La Gomera) and Parque Nacional de la Caldera de Taburiente (La Palma). I am also grateful for assistance provided: in the Canary Islands by Pedro Oromí (Universidad de La Laguna), in Madeira by Henrique Costa Neves (Parque Natural da Madeira) and in Andalusía and Morocco by Benito Valdés (Universidad de Sevilla) and Moh. Rejdali (Institut Agronomique et Vétérinaire Hassan II, Rabat). I acknowledge Roderic Page (Glasgow University) for support and encouragement throughout,

Table 1. Genera and taxa showing native distribution, host plant genus and host group affiliation within the Genisteae.

Species	Native distribution	Host plant genus and group	
ARYTAINILLA			
<i>Arytainilla sensu stricto</i>			
<i>A. algeriensis</i>	N. Africa	<i>Cytisus</i>	CY
<i>A. barbagalloi</i>	Italy	<i>Genista</i>	GE
<i>A. cytisi</i>	Europe, N. Africa, Middle East	<i>Calicotome</i>	CY
<i>A. delarbrei</i>	W. Europe, N. Africa	<i>Cytisus</i>	CY
<i>A. spartiicola</i>	W. Europe	<i>Cytisus</i>	CY
<i>A. spartiophila</i>	W. Europe, N. Africa	<i>Cytisus</i>	CY
<i>A. serpentina</i>	Canary Islands	<i>Spartocytisus</i>	CY
<i>Arytainilla</i> residual species			
<i>A. gredi</i>	Spain	<i>Genista</i>	GE
<i>A. ima</i>	Morocco	<i>Adenocarpus</i>	OU
<i>A. sulci</i>	N. Africa, Middle East	<i>Retama</i>	GE
ARYTINNIS			
<i>A. pileolata</i>	Canary Islands	<i>Teline</i>	GE
<i>A. nigralineata</i>	Canary Islands	<i>Adenocarpus</i>	OU
<i>A. proboscidea</i>	Canary Islands	<i>Adenocarpus</i>	OU
<i>A. equitans</i>	Canary Islands	<i>Teline</i>	GE
<i>A. prognata</i>	Canary Islands	<i>Teline</i>	GE
<i>A. diluta</i>	Canary Islands	<i>Teline</i>	GE
<i>A. romeria</i>	Canary Islands	<i>Teline</i>	GE
<i>A. fortunata</i>	Canary Islands	<i>Teline</i>	GE
<i>A. canariensis</i>	Canary Islands	<i>Teline</i>	GE
<i>A. menceyata</i>	Canary Islands	<i>Teline</i>	GE
<i>A. ochrita</i>	Canary Islands	<i>Teline</i>	GE
<i>A. occidentalis</i>	Canary Islands	<i>Teline</i>	GE
<i>A. gomerae</i>	Canary Islands	<i>Teline</i>	GE
<i>A. hupalupa</i>	Canary Islands	<i>Teline</i>	GE
<i>A. modica</i>	Canary Islands	<i>Teline, Chamaecytisus</i>	GE + CY
<i>A. dividens</i>	Canary Islands	<i>Chamaecytisus</i>	CY
<i>A. umbonata</i>	Madeira	<i>Genista</i>	GE
<i>A. incuba</i>	Madeira	<i>Teline</i>	GE
<i>A. hakani</i>	Mediterranean	<i>Teline</i>	GE
<i>A. cognata</i>	Morocco	<i>Genista</i>	GE
<i>A. berber</i>	Morocco	<i>Genista</i>	GE
ARYTAINA			
<i>A. devia</i>	Canary Islands	<i>Chamaecytisus</i>	CY
<i>A. nubivaga</i>	Canary Islands	<i>Spartocytisus</i>	CY
<i>A. vittata</i>	Canary Islands	<i>Spartocytisus</i>	CY
LIVILLA			
<i>L. monospermae</i>	Canary Islands	<i>Retama</i>	GE

CY, *Cytisus* group; GE, *Genista* group; OU, outlier.

and David Hollis (BMNH) for invaluable assistance and for organizing access to museum collections. I thank the following for comments and criticism: Daniel Burckhardt, Quentin Cronk, David Hollis, Isabel Marshall, Pedro Oromí and Vincent Smith.

Table 2. Taxonomy of the Canarian plant genera in the Genisteae, showing taxon distribution and abundance; and indicating number of samples from each plant taxon and the psyllid fauna.

Canarian Genisteae	Plant distribution	Plant abundance	No. samples, 1997–2000	Psyllid fauna
Genista group				
<i>Genista benehoavensis</i>	P	Rare	4	None
<i>Retama monosperma</i> ssp. <i>rhodorrhizoides</i>	T, G, P	Common	7	<i>Livilla monospermae</i> (T, G, P, H)
<i>Teline canariensis</i>	C, H	Uncommon	3	None (C)
	C	Rare	2	<i>A. equitans</i>
	T	Common	7	<i>A. diluta</i> , <i>A. pileolata</i> , <i>A. canariensis</i> , <i>A. menceyata</i>
<i>Teline gomerae</i>	G	Rare	1	None
<i>Teline microphylla</i>	C	Abundant	10	<i>A. diluta</i> , <i>A. equitans</i> , <i>A. prognata</i>
<i>Teline nervosa</i>	C	Rare	1	None
<i>Teline osyroides</i>	T	Rare	2	<i>A. ochrita</i>
ssp. <i>sericea</i>		Uncommon	2	<i>A. pileolata</i>
<i>Teline pallida</i>	T	Rare	1	None
ssp. <i>pallida</i>		Rare		Unsampled
<i>Teline rosmarinifolia</i>	C	Uncommon	4	<i>A. romeria</i>
ssp. <i>rosmarinifolia</i>		Rare		Unsampled
ssp. <i>eurifolia</i>	C	Rare	1	None
<i>Teline salsoloides</i>	T	Rare	1	None
<i>Teline splendens</i>	P	Uncommon	2	<i>A. fortunata</i>
<i>Teline stenopetala</i> ssp. <i>microphylla</i>	G, H	Common	9	<i>A. gomerae</i> (G), <i>A. hupalupa</i> (G), <i>A. modica</i> (H), <i>A. occidentalis</i> (H)
ssp. <i>pauciovulata</i>	G	Uncommon	3	<i>A. gomerae</i> (G), <i>A. hupalupa</i> (G)
ssp. <i>sericea</i>	P	Uncommon	1	<i>A. occidentalis</i>
ssp. <i>spachiana</i>	T	Uncommon	1	<i>A. menceyata</i> , <i>A. pileolata</i>
ssp. <i>stenopetala</i>	P [C, T, G]	Common	8	<i>A. occidentalis</i> (P), <i>A. modica</i> (P)
Cytisus group				
<i>Chamaecytisus proliferus</i> ssp. <i>angustifolius</i>	T, G	Common	9	<i>A. dividens</i> , <i>Arytaina devia</i>
ssp. <i>meridionalis</i>	C	Abundant	4	<i>A. dividens</i> , <i>Arytaina devia</i>
ssp. <i>proliferus</i>	H	Rare	3	<i>A. dividens</i>
var. <i>hierrensis</i>		Uncommon		2
var. <i>calderae</i>	P	Uncommon	2	<i>A. dividens</i> , <i>Arytaina devia</i>
var. <i>canarieae</i>	C	Common	2	<i>A. dividens</i> , <i>Arytaina devia</i>

Table 2. (Continued).

Canarian Genisteae	Plant distribution	Plant abundance	No. samples, 1997–2000	Psyllid fauna
var. <i>palmensis</i>	P [C, T, G, H]	Abundant	11	<i>A. modica</i> (P), <i>A. dividens</i> (C, T), <i>Arytaina devia</i> (C, T)
var. <i>proliferus</i>	T	Common	2	<i>A. dividens</i> , <i>A. devia</i>
<i>Spartocytisus filipes</i>	T	Rare		Unsampled
	G, P, H	Uncommon	12	<i>Arytaina vittata</i> , <i>Arytainilla serpentina</i> (P)
<i>Spartocytisus supranubius</i>	T	Abundant	4	<i>Arytaina nubivaga</i>
	P	Rare	4	<i>Arytaina vittata</i>
Outlier				
<i>Adenocarpus foliolosus</i>				
var. <i>foliolosus</i>	T, G, P	Common	9	<i>A. nigrilineata</i> (T, G), <i>A. proboscidea</i> (P)
var. <i>villosus</i>	C	Common	6	<i>A. nigrilineata</i>
<i>Adenocarpus ombriosus</i>	H	Rare		Unsampled
<i>Adenocarpus viscosus</i>				
ssp. <i>spartioides</i>	P	Abundant	4	<i>A. proboscidea</i>
ssp. <i>viscosus</i>	T	Abundant	4	<i>A. proboscidea</i>

Canary Islands: C, Gran Canaria; T, Tenerife; G, La Gomera; P, La Palma; H, El Hierro.
[] Plant distribution non-native.

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