

Description of the pre-imaginal stages of *Agrodiaetus violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ, 1979) and notes about compared ecology and morphology

(Lepidoptera: Lycaenidae)

by

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Abstract: The pre-imaginal stages of the endemism *Agrodiaetus violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ, 1979) - type locality: Sierra Almijara, in the southernmost part of the Iberian Peninsula - one of the rarest and most local butterflies in Spain, are described and illustrated for the first time. The larva of this taxon shows that its main characteristic, in L4-L5, is a lateral band formed by a central white line, superimposed on by two other rose-coloured lines. Its ecology, biology and morphology are compared with those of other *Agrodiaetus* HÜBNER, 1822 taxa.

Resumen: Se describen e ilustran por primera vez los estadios preimaginales del endemismo *Agrodiaetus violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ, 1979) -localidad tipo: Sierra Almijara, extremo sur de la Península Ibérica-, una de las mariposas más locales y escasas de España. La larva de este taxón muestra como principal característica, en L4-L5, su banda lateral compuesta de una línea central blanca y dos superpuestas a la anterior de color rosa. Se compara su ecología, biología y morfología con los de otros taxones de *Agrodiaetus* HÜBNER, 1822.

Introduction: We consider *Agrodiaetus* HÜBNER, 1822, as a genus, following the arrangement of KANDUL et al. (2004). This genus has been recently treated by several authors as a subgenus within *Polyommatus* LATREILLE, 1804.

After the description of *A. violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ) in 1979, until its rediscovery 26 years later at its type locality (GIL-T. & GIL-UCEDA, 2005), nothing had been found out about the real status of this butterfly (even its continued existence had been brought into doubt by some Spanish authors). Therefore, nothing was known about its biology and ecology. Even its morphology was little known, although the ♀ was re-described in the previous reference. Despite this fact, and a general lack of information and material for study, it is surprising how some authors, rashly, discussed its taxonomic status, basing their opinions solely on suppositions, regarding this taxon as "*Agrodiaetus fabressei violetae*" (sic) en MUNGUIRA et al. (1995), an opinion which was then subscribed to by other authors, as for example in ECKWEILER & HÄUSER (1997). In TOLMAN & LEWINGTON (1997), for these reasons, further erroneous information was published, this time with respect to its host plant, the ants associated with its larvae, and even on certain aspects of adult morphology - errors which we corrected in LAFRANCHIS et al. (2007).

In GIL-T. & GIL-UCEDA (2005) a new taxa of *Agrodiaetus* was described: *Agrodiaetus fabressei subbaeticus* [note: provisionally ascribed to *Agrodiaetus fabressei* OBERTHÜR, 1910], from the SE. Iberian Peninsula (Fig. 1): in the NE. Granada and Jaen provinces and the S. Albacete province (Sierra de la Sagra, Sierras de Cazorla and Segura, Sierra de Alcaraz, respectively). The populations nearest to *A. f. subbaeticus* GIL-T. & GIL-U. in the type locality of *A. violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ) were around 200 km away (Fig. 1). The imagoes of *A. violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ) show clear differences with regards to the previous mentioned taxa: a smaller wingspan, vestigial or missing black spots (typically in around 90 % of the specimens) and a different ground-colour, mainly in the ♂ (Figs. 2 & 3). The ♀ have a characteristic white stripe on the underside of the hindwings. These clear morphological differences contradict the opinion of MUNGUIRA et al. (1995) again [where it was also listed as “*Agrodiaetus fabressei violetae*” (sic)], and” that in TARRIER (1993) [where is mentioned as “*Agrodiaetus violetae*” s. str.] in considering the populations of *A. violetae* s. str. (type locality, southernmost Iberian Peninsula) and those of SE. Iberian Peninsula [*A. f. subbaeticus*, after the description of GIL-T. & GIL-UCEDA, (2005)], as the same taxa, not to mention the distance of about 200 km between these populations!. Independent of this, the final taxonomic status of the taxon *subbaeticus* (provisional status, pending of a molecular study on mtDNA, COI, COII: in prep.), whose chromosome number was specified as $n = 90$ in LUKHTANOV et al. (2006), both *violetae* s. str. and *subbaeticus* are different taxa according to their external morphology. In the current work, the pre-imaginal stages, the ecology and the biology of the two previous taxa, are compared.

Description of the pre-imaginal stages

Egg: Similar to other taxa within the *Agrodiaetus*; colour white, with a flattened shape. ♀ butterflies lay eggs throughout July, on the leaves, fruit stems or dry plant (flowers are not available in July). The climatic conditions of their habitat (altitude between 1600 and 1800 m, in mountainous areas) and the availability of their host plant leaves *Onobrychis argentea argentea* (Boiss.) allows the eggs to successfully hatch during the summer, normally throughout August. In some populations of *A. f. subbaeticus* GIL-T. & GIL-U. in SE. Spain, at lower altitudes (below 1000 m.), on account of the high temperatures and dryness, where their host plant *Onobrychis argentea hispanica* (SIRJ) leaves are not available, they probably also hibernate as an ovum, in a similar way as indicated for *Agrodiaetus damon* ([DENIS & SCHIFFERMÜLLER], 1775) en TOLMAN & LEWINGTON (1997). In LAFRANCHIS et al. (2007) we pointed out that the mention of *Onobrychis viciifolia* and *Onobrychis peduncularis* given in TOLMAN & LEWINGTON (1997) as host plant for *A. violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ) is incorrect: the only host plant used in its type locality is the previously mentioned *O. argentea argentea*.

Larva: L1-L2: Black head, around 1 mm long in L1, colour and patterns (dorsal black dotting) similar to other taxa of *Agrodiaetus*. They feed on the basal leaves of the host plant. Larvae hatch from the beginning to the middle of August, and those which hatch during late August will hibernate in L2 or L1 respectively. Firstly they begin a short period of quiescence - an alternation of periods of inactivity with other periods of mobility, probably depending on the meteorological conditions - before entering true diapause.

L3: After hibernation, activity is resumed from the middle or end of April, depending upon the weather, and coinciding with the growth of its host plant. During the first days in L3

(col. pl. 8: 4) they are nearly 5 mm in length, but their lateral stripes are not noticeable, being of a yellowish cream colour. To the end of L3 or beginning of L4, a light pink colouration is visible in the superior part of their lateral stripes (col. pl. 8: 5). Up until the end of L3 they only feed on leaflets, leaving just the margins and veins. The colour of the caterpillar is pale green, is very hairy with long white hairs, it has a green dorsal stripe, and the dorso-lateral patterns are poorly defined.

L4-L5: Once the floral buds begin to appear (in L4), and afterwards the flowers (in L5), the larvae feed exclusively on these parts of the host plant. The caterpillars are more active during the central hours of the day. The definitive markings appear in L4 (col. pl. 8: 6), when the ground colour is pale green, with a darker green dorsal stripe, and several dorso-lateral stripes of a dark-green with whitish-green colours. The lateral stripe is composed of three lines (col. pl. 9: 7): a central whitish-cream line, superimposed on by two pink ones, the upper one broader than the inferior. It is interesting to outline that the larvae of *A. f. subbaeticus* GIL-T. & GIL-U., from SE. Spain, in similar climatic and altitudinal conditions, using as host plant *O. argentea hispanica*, a plant with the same range of variation in the colour of its flowers as *O. argentea argentea*, used by *A. violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ), show morphological differences in respect to those of *A. violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ): a different colour to the three lines that compose the lateral stripe, the central line is yellowish cream and the other two lines are of red-wine colour (col. pl. 9: 8); near the dorsal stripe, on the series of yellow dorso-lateral stripes, several dark or reddish-brown marks occasionally appear (col. pl. 9: 9). Towards the end of May, the majority of the caterpillars are in L5, the duration of the larval phase lasts until the first days of June. It is during these stages (L4-L5 mainly) that the caterpillars associate with ants. We have registered its association with only two ant species: *Camponotus cruentatus* (LATREILLE) [col. pl. 8: 6] and *Plagiolepis pygmaea* (LATREILLE) [col. pl. 9: 9, top, on a larva of the taxon *subbaeticus*]. The ant mentioned for *A. violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ) in TOLMAN & LEWINGTON (1997) is incorrect, a fallacy also stated in LAFRANCHIS et al. (2007). We believe that, even though the caterpillars of the genus *Agrodiatus* generally show similar morphology, the colour of the lateral stripe (mainly) and the dorso lateral ones are not solely the result of their phenotype as an adaptation to environmental factors (flower colour). A clear example of this affirmation would be the larva L4-L5 of *Agrodiatus humedasmae* (TOSO & BALLETO, 1976), which according to the description and illustration of MANINO et al. (1987), shows the lateral stripes totally yellow (“bruno giallastre”: yellowish brown), without rose or red colouring. *A. humedasmae* (TOSO & BALLETO) feed on *Onobrychis montana*, a plant with similar flower colours to other *Onobrychis* spp. used by species of *Agrodiatus* whose larvae show lateral lines of red or pink colour.

Pupae: Fresh pupae are a very pale green (col. pl. 9: 10, left), with the dorsal area of the abdomen yellowish. In each lateral of the abdomen, both in *A. violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ) and in *A. f. subbaeticus* GIL-T. & GIL-U., there are two red zigzag lines which remain visible until the pupae adopts a brown background colour (col. pl. 9: 10, right). We have no knowledge of any reference mentioning or illustrating a pupa with these red zigzag lines. LAFRANCHIS (pers. comm.) informed me that he only saw two pupae [one of *Agrodiatus ripartii* (FREYER, 1830), the other of *Agrodiatus admetus* (ESPER, 1785)] with two red lines, but those lines were “more straight” He also found two pupae of *A. ripartii* (FREYER) showing a single

red line. The brown colour of the pupae darkens later on Fig (col. pl. 9: 10, right). The size of the pupa is on average of 11 mm long and 4 mm in width at the thickest part of the abdomen. The pupal stage lasts about 15 days in captivity.

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Colour plate 8/ Farbtafel 8

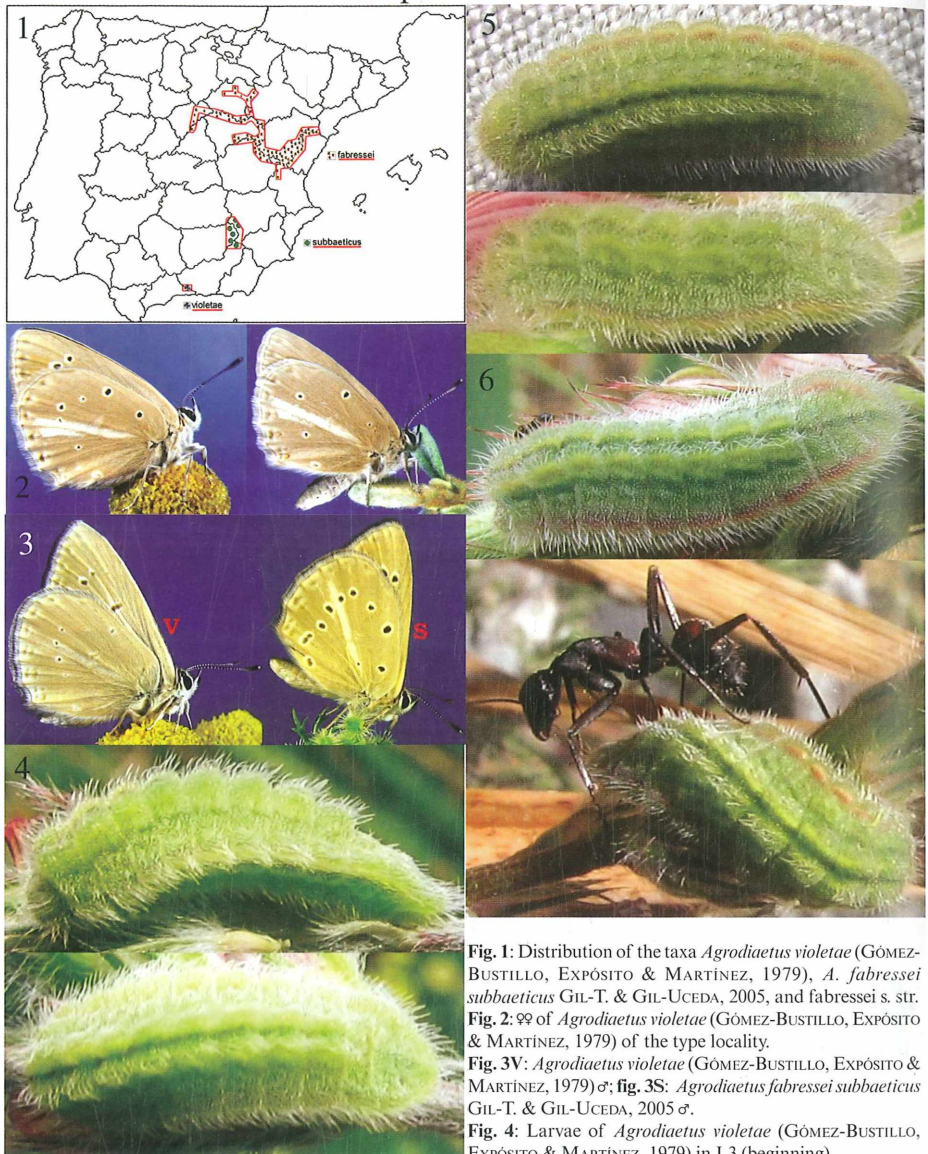


Fig. 1: Distribution of the taxa *Agrodiaetus violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ, 1979), *A. fabressei subbaeticus* GIL-T. & GIL-UCEDA, 2005, and *fabressei* s. str. **Fig. 2:** ♀♀ of *Agrodiaetus violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ, 1979) of the type locality. **Fig. 3V:** *Agrodiaetus violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ, 1979) ♂; **fig. 3S:** *Agrodiaetus fabressei subbaeticus* GIL-T. & GIL-UCEDA, 2005 ♂. **Fig. 4:** Larvae of *Agrodiaetus violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ, 1979) in L3 (beginning).

Fig. 5: Larvae of *Agrodiaetus violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ, 1979) in L3 (end). **Fig. 6:** Larvae of *Agrodiaetus violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ, 1979) in L4; ant (bottom): Camponotus cruentatus. **Fig. 7:** Larvae of *Agrodiaetus violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ, 1979) in L5. **Fig. 8:** Larvae of *Agrodiaetus fabressei subbaeticus* GIL-T. & GIL-UCEDA, 2005 in L5. **Fig. 9:** Larvae of *Agrodiaetus fabressei subbaeticus* GIL-T. & GIL-UCEDA, 2005 (L5), forms; ants: Plagiolepis pygmaea. **Fig. 10:** Sequence of pupae of *Agrodiaetus violetae* (GÓMEZ-BUSTILLO, EXPÓSITO & MARTÍNEZ, 1979) according to age.

Colour plate 9/ Farbtafel 9

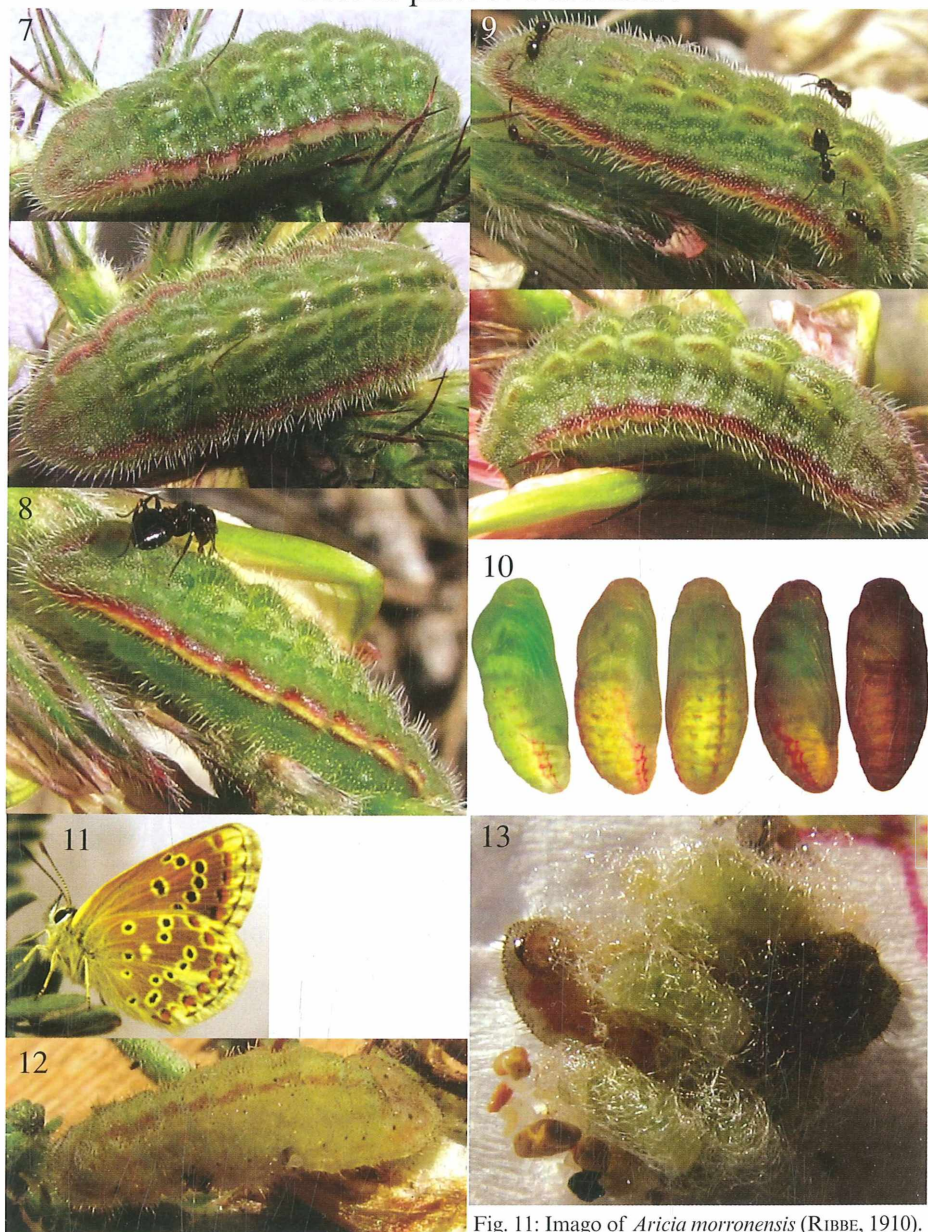


Fig. 11: Imago of *Aricia morronensis* (RIBBE, 1910).

Fig. 12: Larva of *Aricia morronensis* (RIBBE, 1910) parasitised by *Cotesia tenebrosa* WESMAEL.

Fig. 13: Cocoons of *Cotesia tenebrosa* and larva of *Aricia morronensis* (RIBBE, 1910).

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