Discovery of two populations of Lopinga achine (Scopoli, 1763) (Lepidoptera: Nymphalidae) in the Montes de Vitoria, northern Spain

M.Á. DOMINGO

Gipuzkoako Entomologia Elkartea / Asociación Gipuzkoana de Entomología; Apdo. 193 P.K.; E-20120 Hernani (Gipuzkoa); E-mail: migueangel.domingo@hotmail.com

Abstract
The finding of two new populations of Lopinga achine (Scopoli, 1763) in Spain is reported. They are located in the Montes de Vitoria, in the province of Álava. The habitat is described, the phenology is discussed briefly and the general implications for the conservation of this species are dealt with.

Key words: Lopinga achine, Montes de Vitoria, Álava, Spain.

Resumen
Hallazgo de dos poblaciones de Lopinga achine (Scopoli, 1763) (Lepidoptera: Nymphalidae) en los Montes de Vitoria, Álava, norte de España

Se da a conocer el hallazgo de dos nuevas poblaciones de Lopinga achine (Scopoli, 1763) en España. Se encuentran situadas en los Montes de Vitoria, en la provincia de Álava. Se describe el hábitat, se discute brevemente su fenología y se tratan las implicaciones generales para la conservación de esta especie.

Palabras clave: Lopinga achine, Montes de Vitoria, Álava, España.

Introduction
The Woodland Brown, Lopinga achine (Scopoli, 1763), is a Satyrinae butterfly with a very wide Eurasian distribution that spreads from northern Spain, across the temperate areas of central Europe and Siberia to Manchuria and Japan (Kodandaramaiah et al., 2012). The species is linked to the successional stages of woodlands, mainly deciduous or mixed forests and, to a much lesser extent, coniferous forests. Within this frame, it inhabits clearings and glades, frequently of relative small size – mostly between 100 m² and 600 m² (Bergman and Landin, 2002; Koschuh, 2008) –, forest edges or even forest track margins, where the rather light density of the canopy allows a good growth of the understorey vegetation, particularly the herbaceous layer.

In fact, according to Bergman (1999), the oviposition takes place and the larvae develop only in a narrow fringe at the glade edges, mainly on the side of the...
closed wood and rarely more than 6 m of distance apart. This preference seems related, in first place, to the sensibility of the eggs to desiccation. The females, which seek humid grass vegetation in well-shadowed places at the clearing margins, drop their eggs dispersely to the ground by just bowing the abdomen tip while in flight. The eggs hatch in about 15 days and the larvae hibernate at their third instar sheltered in grass tussocks and cocoon at the end of May or the beginning of June of the following year (Bergman, 1999; Wagner, 2017).

*L. achine* is a univoltine species with an emergence period lasting, in western and central Europe, from about the beginning of June to mid or late July, with extreme dates from the first half of May to the first week of August. Within this timeframe, the flight period varies according to the locality and the year, but it is very short and concentrates mostly in about 4 weeks.

One of the most controversial aspects of the life history of *L. achine* is the diet of the larvae. They have been reported as able to feed from several grasses (Poaceae) and, apparently, also woodrushes (Juncaceae) (see particularly: Bergman, 2000; Lindman et al., 2013) both in natural and, specially, in experimental conditions. However, there is evidence that the sedges of the genus *Carex* (Cyperaceae), especially the low-growing fine-leaved species, play an important role as host plants during the larval stages. The list of *Carex* species from which feeding by *L. achine* has been reported, includes *C. montana* (Bergman, 1999), *C. brizoides* (Koschuh, 2008), *C. alba* (Geh, 2002; Streitberger et al., 2012; Wagner, 2017), *C. fritschi* and *C. micheli* (Kovnička et al., 2008) and *C. sylvatica* (Lindman et al., 2013). Habitat and diet seem to relate by the need of the larvae to reach the developmental stage suitable for hibernation before the grasses wilt. Bergman (1999) considers that the preference for *Carex* derives from the lower availability of the Poaceae in the occupied habitats and the higher survival rate of first instars larvae on the sedges. In partial disagreement, Lindman et al. (2013) conclude that *L. achine* is broadly polyphagous on grasses and sedges, just admitting some general predilection for mesophytic soft- and broad-leaved species of sedges that are, due to their inadequacy to resist desiccation, ubiquitous in shady and moist forests.

As for the Spanish populations, *L. achine* was known so far from only two different nuclei within the Cantabrian range: the first one in scattered populations in the Picos de Europa and the surrounding areas (provinces of Asturias, León and Cantabria) and the second one in the Sierra Sálvada (Romo et al., 2012). Monasterio et al. (2014) have recently investigated this second metapopulation in more detail, pointing out that *L. achine* is limited to the northern slopes of these mountains, in the territories of Alava and Biscay. To the east, the closest known population are located in the French Pyrenees, in the Aspe and Ossau valleys (Gourvil et al., 2016) (see map of Fig. 1). García-Barros et al. (2006) describe the habitat in Spain as deciduous forest edges and clearing with
a high tree cover (beech, oak and lime tree) on calcareous terrain with Atlantic influence, and within an altitudinal range between 300 m and 800 m, rarely reaching 1000 m. The scarce published data for Spain portrait this species as rare even in the habitats where it appears, with low densities that, even under favourable conditions, seldom lead to the observation of more than 8 individuals in a sampling (Mortera et al., 2011). As for the emergence period, García-Barros et al. (2013) indicate that in Spain L. achine flies from the end of June to the first half of August, but Monasterio et al. (2014) have encountered this species from the very end of May. Little more is known about other traits of the life history of L. achine in this area.

L. achine is a threatened butterfly in western Europe, where it has suffered an important decline during the 20th century. This has led to its disappearance from many regions and to its rarefaction in many others, a decline that continues yet (Kodandaramaiah et al., 2012). It is listed in the Annex 4 of the Habitats Directive of the European Union and it has been awarded the category of Vulnerable in Spain (Mortera et al., 2011). The main factor for the regression of L. achine relay in the abandonment of traditional woodland uses such as (fire)wood extraction, coppicing, leaf-litter gathering or cattle grazing, which maintained an adequate habitat for the species (Streitberger et al., 2012). In some cases, it has implied a modification of the manner of exploitation, either by afforestation or by tree management aimed to timber production. In some others, it has entailed just the successional regrowth and thickening of the arboreal vegetation. These changes have resulted in a modification of the structure of the forests, particularly an increase of the canopy closure, the disappearance of clearings and a profound change in the composition of the floor vegetation (Streitberger et al., 2012).

Methods

In spring 2017, some entomological prospections were conducted in the Montes de Vitoria (provinces of Alava and Burgos) paying some extra attention to the Lepidoptera, in order to photograph them for documentary purposes. The discovery of the first population of L. achine in the Montes de Vitoria was the direct result of these prospections and, aware of the interest of this finding, two additional visits were finally undertook in potentially suitable near areas. While the first one was fruitless, the second one allowed pinpointing an additional population. No voucher specimens were captured; all the records correspond to visual observations or photographic records. Apart from these two positive prospections, a third one was carried out in the meantime, on 5 June 2017, to the Alto de Ascarrzacoa, also in the proximity of Ullivarrí de los Olleros, and, in spite of the habitat being very similar, the species was not found there.

![Figure 2. Lopinga achine in the Montes de Vitoria: (a) Resting on brambles in Cima Saimendi, Ullivarrí de los Olleros 2 June 2017; (b) Feeding on a carnivore scat in Aranduia, Andollu 7 June 2017.](image)
Results

ALAVA: Municipality of Vitoria-Gasteiz: UTM (WGS84) 30TWN3137 765 m SE slope of Cima Saimendi, Ullivarrri de los Olleros 2 June 2017; 30TWN3539 650 m Aranduia, Andollu 7 June 2017.

These two populations of *L. achine* are located on the northern slopes of the Montes of Vitoria in a particularly humid Eurosiberian mesomontane section. In the lower areas, the substrate is composed of Cretaceous limestone marls dating from the lower and middle Campanian, and in the higher parts, sandstones and calcareous sandstones of the upper Campanian dominate. The main vegetation correspond to a *Quercus faginea* forest of the *Pulmonario longifolii-Quercetum fagineae queretosum fagineae* Loidi & Herrera, 1990 subassociation. However, the transitional nature of the substrate is evidenced by the local introgression of the *Quercus pyrenaica* forest; likewise, the orientation and the elevation cause the local mixture with the acidophilus beech forest. There is a diverse cohort of other trees, particularly *Quercus robur*, *Fraxinus excelsior*, *Sorbus terminalis*, *Corylus avellana* and *Crataegus* spp. Some plantations of conifers, mainly *Pinus sylvestris* and *Pinus nigra*, have some importance. In the areas where *L. achine* was found a brief analysis of the grass-like species along the track edges was carried out, resulting in *Brachypodium sylvaticum* and *Carex sybitica* being the dominant ones.

The first population was discovered along a forest way on Cima Saimendi, near the village of Ullivarrri de los Olleros (Fig. 3a). This way is an ascending forest track for vehicle service whose main orientation, except for the lower part, is N to S, what enables a good illumination in the central hours of the day. Apart from some conifer plantations that flank the lower stretch of the way, the rest of the path is tightly fenced by the forest except for a relatively narrow clearing midway. While on the downhill slope off the track the cover tree is almost 100% and the trees have a bigger size, in the uphill slope the Portuguese oaks and the arboreal vegetation in general is younger, grow rather stunted and reach a scanty to moderate height, rarely exceeding 20 cm of trunk diameter and a height of 5 m. In consequence, the canopy is not so close on this upper part of the hillside and the understory is mainly herbaceous and fairly devoid the low shrubs that tend to grow on sunnier patches. A maximum of 7 individuals was observed along this track in an altitudinal range from 710 m to 765 m.

The second population was found in the relative proximity of the former one, just about 4 km apart in a straight line, in the locality of Aranduia, close to the village of Andollu. It is located in a crossway of forest tracks, whose main one has a NW to SE orientation, over a relatively flat area at about 650 m of elevation (Figs. 3b-c). Here the forest is composed of trees almost even in size of about 10 m high. While the forest edges are abundantly covered with a variety of shrubs and the clearings at the track sides are, for the most, narrow, in many stretches under the shadow of the canopy, and extending well inside it, there is a clean and dense grass layer. Besides, in some places it was possible to observe traces of the traditional firewood extraction activity, locally called «suertes fogueales». In this population, a maximum of 6 individuals was observed.

Since the discovery of the first population was a result of hazard and the second one the result of an effort to just localize new locations of the species, few observations were gathered regarding the behaviour or other features related to *L. achine*. In general, the butterflies showed a tendency to remain resting on the leaves of the shrubs of the track edges (Fig. 2a), particularly *Crataegus*, generally at a height of more than 1 m and, often, at more than 2 m. In Aranduia two individuals were observed flying inside the wood and perching on the lower branches of the oaks (Fig. 3b). Besides, two individuals of *L. achine*, one in the Cima Saimendi and one in Aranduia (Fig. 2b), were observed repeatedly returning to feed on a carnivore scat that laid in the middle of the track.

Discussion

As for the phenology, it is interesting to point out that the adult emergence period in the nearest population, that from the Sierra Sálvada (situated about 35 km to the NW in a straight line; see map in Fig. 1), seems to comprise fundamentally the month of July, but there are some contradictory records that either imply a longer period of two months or a significant interannual difference. The first record of the species in this area reported by Gómez de Aizpúrua (1970) dates from 17 July 1962 and 10 July 1969. Later Olano et al. (1989) indicate the occurrence of adults in the month of July without further detail. The most abundant phenological data come from Monasterio et al. (2014), who observed this species on 8-VII-2008,
between 29 May and 2 July 2011, between 10 July and 23 July 2012 and between 14 July and 28 July 2013. By contrast, the two records of the Montes de Vitoria are restricted by the moment just to the very beginning of June; whether this represents an exceptionally advanced season due to the climatic conditions of 2017 or simply the common pattern in this area needs to be investigated.

Regarding the feeding habits, it is noteworthy to mention that, from the two main grass-like species identified in the occupied area of the Montes de Vitoria, Carex sylvatica has been experimentally probed to be acceptable for L. achine (Lindman et al., 2013) and, concerning Brachypodium sylvaticum, there are direct observations in nature of larvae feeding on it (Geh, 2002; Wagner, 2017). This makes plausible that the diet of L. achine in this area includes, or, even, is based on these two species; an aspect that would require further research.

The fortuitous finding of new populations of L. achine in the Iberian Peninsula is good news for this threatened species. Even if there is no ground to discard, as an alternative hypothesis, a recent colonization of the Montes de Vitoria by L. achine, the reasonable explanation is the overlooking of these populations up to the present because of the secluded habitat and the short flying period. The northern slopes of the mountain chain that extends from the Montes de Vitoria, in Alava, to the Sierra de Sarrústegui, in Navarre, could potentially host more populations of L. achine left so far unnoticed. Habitats that apparently fit the requirements of the species are not limited to the area where the two populations reported here were found.

It might be significant that the two populations from the Montes de Vitoria are associated to forest tracks and their transitional vegetation and to the continuation of some ancestral practices of firewood extraction, both of them depending on human management of the woodlands. The challenging aftermath of this finding would be to understand the precise ecological conditions needed by L. achine in this area and to implement the appropriate management actions to revert or contain the evident increasing rarefaction of the light forests and other open habitats that were widespread here several decades ago. For this purpose, Van Swaay et al. (2012) have summarized a set of recommendations and measures to preserve the habitat of L. achine actively, whose practical implementation is depicted in more detail, for example, by Ryelandt (2016). They focus on maintaining light forests with low undergrowth by selective cutting, improving the open corridors along the forest roads by periodical clearing and keeping a network of abandoned small meadows interspersed in the forest.
References


