Phytophagous insects captured in carrion-baited traps in central Spain

Arturo Baz¹, Blanca Cifrián¹, Daniel Martín-Vega¹, Manuel Baena²

¹Departamento de Zoología y Antropología Física, Universidad de Alcalá, Alcalá de Henares, Madrid, Spain ²Departamento de Biología y Geología, I.E.S. Trassierra, Córdoba, Spain

Abstract

We present a list of 114 different species of phytophagous insects (Hymenoptera Apoidea, Lepidoptera and Heteroptera) that were collected in carrion-baited traps in central Spain. We discuss the feeding habits of these insects as found in previously published literature, especially in tropical environments. In each group studied, the reasons for their attraction appear to be different, but in any case, we demonstrated that many species of phytophagous insects exploit this resource, at least on an occasional basis and that it is a regular activity in temperate and not only tropical latitudes.

Key words: Apoidea, Lepidoptera, Heteroptera, necrophagy, carrion.

Introduction

The arthropod fauna that come to dead animal bodies varies considerably in relation to habitat and environmental conditions. Their mode of action may be affected by the type of body that they find. In general, when they discover dead invertebrates, they can be disaggregated or buried very quickly. However, when it comes to bodies of vertebrates, there are a wide variety of arthropods species that exploit this resource as it is of high quality. Moreover, there is a sequential pattern of carrion-feeding species that will colonize and remove carrion along a specific decomposition process. Insects visiting carrion exploit this resource in many different ways, which allows a number of trophic groups or categories according to the criteria of Leclercq (1978) and Braack (1987) as follows:

- 1 Necrophagous: They feed directly from the bodies and usually complete their life cycle on them. These include sarcophagous species, where they feed on the flesh and soft tissue, and dermatophagous, if they feed the skin.
- 2 Necrophilous: Those that eat the carrion-feeding and are predators. Predators capture and feed on the other arthropods in the environment (mostly Diptera larvae). Parasites use the larvae of flies or other insects to complete their life cycle.
- 3 Saprophagous: In general, they feed on decomposing organic matter; in this case, those that feed upon the fluids and tissues of rotting corpses. They do not usually complete their life cycle on the body, and sometimes simply are attracted to odors of putrefaction. Therefore they are not strictly necrophagous.
- 4 Opportunistic or casual: Those species that use the body as a refuge or simply in passing, or have a diet completely different from necrophagous but occasionally can obtain nutrients from the bodies as a food supplement.

Many insect species belong to this last category. Some are insects with strictly phytophagous diets that occasionally feed on non-plant material, or insects that are strictly phytophagous in the larval stage and may feed at other sources as adults. These alternative food sources, including bird droppings, dung and carrion. Many examples are known in Heteroptera (Adler and Wheeler, 1984) and tropical butterflies (see Molleman et al., 2005 for a recent review of this behaviour). Among bees (Apoidea) there is the remarkable well-known case of Trigona hypogea Silvestri, an obligate necrophage, that uses carrion instead of pollen as a protein source (Roubik, 1982) and other Meliponinae (stingless bees) that occasionally collect faeces and carrion (Silveira et al., 2005). The reasons behind this behaviour are still not clear and depend largely on the type of insect involved. In this paper we present a compilation of species of phytophagous insects (Lepidoptera, Heteroptera and Hymenoptera Apoidea) that have been collected, in recent surveys in central Spain, in carrion-baited traps. We also discuss, based on the previously published literature, the meaning of this unusual behaviour for each of the insect groups considered.

Materials and methods

To capture carrion visiting insects we used carrion-baited traps modified from the design of Morón and Terrón (1984) (for more details see also Baz et al., 2007). Although the study of necrophagous insects through the use of Wing Oriented Traps (WOT) is more frequent (Martínez-Sánchez et al., 1998), we prefer to use a more robust trap that can remain installed for longer periods of time. Traps were baited with squid. The use of squid as a bait has been shown to be very effective in such ecological studies because it maintains a moist state of decay for much longer periods than other baits (e.g., chicken or liver, Newton and Peck, 1975). The bait was place inside a perforated plastic jar that prevents access to the bait by insects, and prevents accidental falling of insects into the bait. Traps were semi-buried into the ground so that there was 8-10 cm between the edge of the trap and the ground surface. Finally, traps were protected with a perimeter of stones to avoid destruction by wild animals that were attracted by the carrion. Data were collected in different surveys conducted in the centre of the Iberian Peninsula designed to study the necrophagous fauna. Each survey was designed to address a different objective, and the data cannot then be compared between sites from a quantitative point of view. A brief description of the three surveys follows.

Survey 1

Designed to study the variation of the assemblages of necrophagous insects along an altitudinal gradient (Baz et al., 2007). Samples were collected between the localities of Lozoya and Puerto de Navafría (Madrid province). Nine trapping sites were selected along an altitudinal gradient at 100 m intervals between 1100 and 1900 m a.s.l. (both included), with one trap at each site. Traps were maintained during June, July and August of 2003 and were visited every 15 days. On each visit, the specimens were collected and the bait replaced, so that traps were operating without interruption for 90 days. At the end, 53 samples were taken as one sample at site 8 was destroyed, probably by a wild animal.

Survey 2

Designed to study the habitat associations of necrophagous insects on a regional scale. Traps were set up at sites throughout the province of Madrid. Twenty one sites were selected, providing sampling of 7 habitat types. To cover the environmental heterogeneity of each sampling site, three traps at each site were installed. So, a total of 63 traps were installed in the study area and were maintained from June 2006 to May 2007. Traps were operated for a period of seven days within each month. A total of 756 samples were obtained (63 traps x 12 times), although samples obtained during the winter provided virtually no insects. If we consider only the favourable period of April to September, there were 378 samples.

Survey 3

We determined the necrophagous insects of the "Hoces del rio Riaza" Natural Park (Segovia province). A total of 10 sites were selected as representative of 5 habitat types. Traps operated 15 days each month (June to September 2007). At the end, 36 samples had been obtained as four samples were destroyed. Moreover, despite all the precautions taken, it is possible to find individual insects caught accidentally that were not attracted to carrion. So, in this last survey we attempted to avoid this problem. Next to each active trap, we are installed a control trap, similar to the carrion-baited trap, except for the fact that control traps were not baited with carrion. Thus, by examining catches of the control traps, we could determine which species were caught occasionally and not attracted to carrion. In these samples we did not find any Apoidea, Lepidoptera or Heteroptera in the control traps. Therefore we assume that in the other samples, the species were attracted by the carrion. Therefore, in this paper, we only take into account those species that are really attracted to carrion and we have eliminated the species that were trapped accidentally.

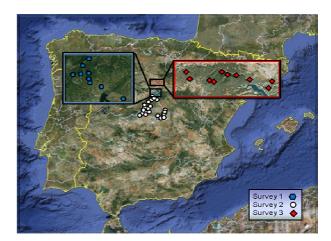


Figure 1. Map of the Iberian Peninsula with the location of the sampling sites.

A brief description of the localities sampled, together with their geographical locations, is provided in table 1 and a map with the location of sampling sites can be found in the figure 1.

Results and discussion

Together for the three different surveys, we trapped a total of 918 individuals of 114 different phytophagous insect species (see table 2 for a detailed overview of trap catches). Also, detailed data about the number of species, number of individuals, occurrences and sex-ratio, can be found in table 3.

Hymenoptera-Apoidea

A total of 276 individuals belonging to 19 species are bees. In addition to T. hypogea and other Meliponiinae (Roubik, 1982; Silveira et al., 2005), other records of non-plant food by bees are those of the honey bee (Apis mellifera L.) and Bombus impatiens Cresson which fed on the fluids at a pig carcass (Payne, 1965), the tropical Bombus ephippiatus Say feeding on mammalian faeces and the temperate *Bombus terrestris* (L.) feeding on bird droppings, human urine and carrion (Herrera, 1990). Apoidea have been recorded (without a specific identification) at carrion on the Iberian Peninsula by Arnaldos et al., (2004) and Castillo-Miralbes (2002). Our data are consistent with those found in the scientific literature. The most common bee species in our traps was the honey bee, which was caught in all 3 of the surveys. Seven different species of bumbles bees were trapped in our studies. Of these, Bombus pascuorum (Scopoli) and Bombus humilis Illiger were the most common. Anthophoridae and Megachilidae bees have not been recorded prior to now as attracted to carrion. Several species of Amegilla and Anthophora, as well as different genera of Megachilidae were taken for first time in relation to non-plant food. By instance, Megachile pilidens Alfken was trapped with carrion in all three surveys. The only Halictidae trapped was *Nomiapis diversipes* (Latreille), and only in Survey 3. However, the abundance and site frequency of this species in traps suggest that it may use

Table 1. Description of the localities sampled. Climatic data have been obtained from Ninyerola *et al.* (2005) and they represent the annual Maximum, Minimum, and Mean Temperature as well as the total rainfall.

| 4538581) 1900 4537778) 1800 4536918) 1600 4536285) 1500 4536203) 1400 4535206) 1200 4535206) 1200 4535206) 1200 4467550) 810 4467550) 810 446757) 730 4467709) 750 4467709) 750 4509340) 750 4509426) 901 4509426) 903 4509426) 903 | UTM coordinates Main vegetation type | Temperatu mean max | Temperature °C | Total raıntall |
|--|--|---|----------------|----------------|
| -1 (30T 432653, 4538581) 1900 -2 (30T 431902, 4537778) 1800 -3 (30T 430781, 4536716) 1700 -4 (30T 432498, 453618) 1600 -5 (30T 432498, 453618) 1600 -5 (30T 432493, 453623) 1400 -7 (30T 432736, 4535203) 1400 -8 (30T 432736, 4535206) 1200 -9 (30T 432736, 4535206) 1200 -9 (30T 432736, 4535206) 1200 -10 (30T 43602, 453374) 1100 -10 (30T 480340, 4472921) 730 -10 (30T 480340, 4472921) 730 -10 (30T 480340, 4472921) 730 -10 (30T 480340, 447309) 750 -10 (30T 480340, 447309) 750 -10 (30T 480340, 447309) 750 -10 (30T 480340, 446350) 810 -10 (30T 480340, 446380) 820 -10 (30T 480480, 446380) 820 -10 (30T 380567, 446384) 815 -10 (30T 399023, 4482478) 922 -10 (30T 399023, 4482478) 922 -10 (30T 39940, 4481102) 971 -10 (40 Navafria (30T 436780, 453879) 1121 -10 (40 Navaecrada (30T 436780, 4538373) 100 -10 (40 Navaecrada (30T 436780, 4538380) 1050 -10 (40 Navaecrada (30T 436736, 459880) 1050 -10 (40 Navaecrada (30T 449536, 4598880) 1050 -10 (40 Navaecrada | | | | |
| -2 (30T 431902, 4537778) 1800 -4 (30T 432498, 4536918) 1600 -5 (30T 432498, 4536918) 1600 -5 (30T 432498, 4536918) 1600 -6 (30T 432493, 4536585) 1500 -8 (30T 432493, 4536585) 1500 -9 (30T 43256, 4536203) 1400 -9 (30T 432736, 4535206) 1200 -9 (30T 480340, 4472921) 730 -10 (30T 480340, 4472921) 730 -10 (30T 480896, 4461005) 750 -10 (30T 480896, 4461005) 750 -10 (30T 480896, 4461005) 750 -10 (461 Prado) (30T 480896, 4461005) 750 -10 (461 Prado) (30T 397145, 4453188) 620 -10 (30T 397145, 445864) 515 -10 (46 Manzanares) (30T 39903, 4482478) 905 -10 (46 Manzanares) (30T 436732, 4533732) 1295 -10 (46 Navaecrada) (30T 436732, 4533732) 1295 -10 (46 Navaecrada) (30T 436732, 4533732) 1050 -10 (46 Navaecrada) (30T 436732, 4533732) 1050 -10 (46 Navaecrada) (30T 449576, 459462) 1071 -10 (46 Navaecrada) (30T 449576, 459482) 1050 -10 (49 (49 Navaecrada) (30T 449576, 4598428) 1057 -10 (49 (49 Navaecrada) (30T 449536, 4598428) 1057 -10 (49 (49 Navaecrada) (30T 4495622, 4598038) 1057 -10 (49 (49 Navaecrada) (30T 449517, 4598128) 1057 -10 (49 (49 Navaecrada) (30T 449517, 4598179) 1053 -10 (49 (49 Nega) (30T 449517, 4598179) 1053 -10 (49 (49 Nega) (30T 450617, 4599179) 1033 -10 (40 (49 Nega) (30T 450617, 4599179) 1030 -10 (40 (40 Nega) (30T 450617, 45991719) 1030 -10 (40 (40 Nega) (30T 450617, 4508171) 1030 -10 (40 (40 Nega) (30T 450617, 4508171) | 1900 Cytisus oromediterraneus shrublands in a cleared pinewood of Scot's pine (Pinus sylvestris L.) | ∞ | 14 | 707 |
| -3 (30T 430781, 4536716) 1700 -4 (30T 432498, 4536918) 1600 -5 (30T 432498, 4536203) 1400 -7 (30T 432556, 4536203) 1400 -7 (30T 432556, 4536203) 1400 -8 (30T 43256, 4536203) 1400 -9 (30T 432707, 4535206) 1200 -9 (30T 480340, 4472921) 730 -10 de las Fuentes (30T 480340, 4472921) 730 -10 de la Fuentes (30T 480946, 4460577) 730 -10 de la Fuentes (30T 480996, 4460777) 730 -10 del Prado (30T 480896, 4461005) 750 -10 del Prado (30T 480896, 4461005) 750 -10 del Prado (30T 397145, 4453188) 620 -10 del Prado (30T 397145, 4453188) 620 -10 del Prado (30T 397145, 4453188) 620 -10 del Prado (30T 397145, 4453189) 905 -10 del Prado (30T 397145, 4453189) 905 -10 de Manzanares (30T 436780, 4533732) 1121 -10 de Manzanares (30T 424771, 4491102) 971 -10 de O de la Mina (30T 449576, 4519462) 1711 -10 de de la Vega (30T 446756, 4598380) 1050 -10 de la Vega (30T 446756, 4598380) 1050 -10 de la Vega (30T 446756, 4598380) 1050 -10 de la Vega (30T 446756, 4598128) 905 -10 de la Vega (30T 446526, 4598028) 903 -10 de la Vega (30T 446522, 4598028) 903 -10 de la Vega (30T 446527, 4598028) 903 -10 de la Vega (30T 446517, 4599179) 903 -10 de la Vega (30T 45091719) 903 -10 de la Vega (30T 4509171, 4597179) 903 -10 de la Vega (30T 4509171, 4597179) 903 -10 de la Vega (30T 4509171, 4599179) 903 | 1800 Scot's pine forest (Pinus svlvestris) | ~ | 14 2 | 710 |
| 4 (307 422498, 4536918) 1600 -5 (307 422493, 4536585) 1500 -6 (307 432556, 4536203) 1400 -8 (307 432736, 4535206) 1200 -8 (307 432707, 4535206) 1200 -9 (307 433707, 4535206) 1200 -9 (307 433707, 4535206) 1200 -9 (307 480340, 4472921) 730 -10 da de las Fuentes (307 480340, 4472921) 730 -10 da de las Fuentes (307 480340, 4472921) 730 -10 da de las Fuentes (307 480340, 4472921) 730 -10 da de la Vega (307 480340, 4472921) 730 -10 del Prado (307 480340, 4443709) 750 -10 del Prado (307 4804445) 640 -10 del Prado (307 399023, 4462445) 640 -10 del Prado (307 399023, 4482478) 922 -10 de Manzanares (307 404526, 4467450) 905 -10 de Manzanares (307 436780, 4533732) 1295 -10 o de Navafría (307 436780, 4533732) 1295 -10 o de Navafría (307 436732, 4533732) 1050 -10 de la Vega (307 436732, 453830) 1050 -10 de la Vega (307 446540, 4599328) 901 -10 de la Vega (307 446540, 4599328) 1051 -10 de la Vega (307 446540, 4599328) 1051 -10 de la Vega (307 446540, 4599328) 901 -10 de la Vega (307 446536, 4599426) 901 -10 de la Vega (307 446526, 4598038) 1057 -10 de la Vega (307 446526, 4598028) 903 -10 de la Vega (307 45652, 458802 | 1700 Scot's pine forest (Pinus sylvestris) | ∞ | | 770 |
| -5 (30T 432493, 4536585) 1500 -6 (30T 432556, 4536203) 1400 -8 (30T 432736, 4535458) 1300 -8 (30T 433707, 4535206) 1200 -9 (30T 433707, 4535206) 1200 -9 (30T 433707, 4535206) 1200 -9 (30T 480340, 4472921) 730 -10 da de las Fuentes (30T 480940, 4472921) 730 -10 da de las Fuentes (30T 480940, 4472921) 730 -10 da de las Fuentes (30T 480996, 4461005) 730 -10 de la Vega (30T 480996, 4461005) 730 -10 del Pardo (30T 480494, 443709) 750 -10 del Pardo (30T 386567, 445281) 660 -10 del Manzanares (30T 494260, 446445) 610 -10 de Manzanares (30T 495784, 452864) 515 -10 de Manzanares (30T 436780, 4533579) 1121 -10 de Manzanares (30T 436780, 4533579) 1121 -11 de Manzanares (30T 436780, 4533579) 1121 -12 de de Manzanares (30T 446540, 4593332) 1295 -12 o de Navafría (30T 446540, 4599328) 996 -12 ejo de la Vega (30T 446540, 4599328) 1050 -12 ejo de la Vega (30T 446540, 4599328) 1050 -12 ejo de la Vega (30T 446540, 4599328) 901 -12 ejo de la Vega (30T 446536, 4599426) 901 -12 ejo de la Vega (30T 446526, 4598038) 1057 -12 ejo de la Vega (30T 446526, 4598028) 903 -12 ejo de la Vega (30T 446652, 4598028) 903 -12 ejo de la Vega (30T 446517, 4597179) 903 -12 elo de la Vega (30T 456171, 4597179) 903 -12 elo de la Vega (30T 456171, 4597179) 903 -12 elo de la Vega (30T 456171, 4597179) 903 -12 elo de la Vega (30T 456171, 4597179) 903 -12 elo de la Vega (30T 456171, 4597179) 903 -12 elo de la Vega (30T 456171, 4598179) 903 -12 elo de la Vega (30T 456171, 4597179) 903 -12 elo de la Vega (30T 456171, 4597179) 903 | 1600 Scot's pine forest (Pinus sylvestris) | 6 | | 099 |
| -6 (30T 432556, 4536203) 1400 -8 (30T 432736, 4535458) 1300 -8 (30T 433707, 4535206) 1200 -9 (30T 433707, 4535206) 1200 -9 (30T 43602, 453374) 1100 -10 a de las Fuentes (30T 480940, 4472921) 730 -10 dade la Vega (30T 480996, 4461005) 730 -10 del la Vega (30T 480996, 4461005) 730 -10 del la Vega (30T 480996, 4461005) 730 -10 del la Vega (30T 480494) 620 -10 del la Vega (30T 386567, 445281) 660 -10 del la Vega (30T 494245) 1121 -10 de Manzanares (30T 494245) 1121 -11 de Manzanares (30T 436780, 4533579) 1121 -12 de Manzanares (30T 4495374, 459362) 1950 -12 de la Vega (30T 446540, 4599328) 1050 -12 de la Vega (30T 446540, 4599328) 1050 -12 de la Vega (30T 446540, 4599328) 1050 -12 de la Vega (30T 446536, 4598040) 1081 -12 de la Vega (30T 446536, 4598028) 1057 -12 de la Vega (30T 446536, 4598028) 1057 -12 de la Vega (30T 446526, 4598028) 1057 -12 de la Vega (30T 446517, 4599179) 993 -12 de la Vega (30T 456171, 4597179) 993 -12 de la Vega (30T 456171, 4598179) 903 -12 de la Vega (30T 456171, 4599179) 993 -12 de la Vega (30T 456171, 4598179) 993 | 1500 Mixed forest of Scot's pine (Pinus sylvestris) and oaks (Quercus pyrenaica) | Ξ | 17 4 | 662 |
| -7 (30T 432736, 4535458) 1300 -8 (30T 433707, 4535206) 1200 -9 (30T 436602, 453374) 1100 da de las Torres (30T 480340, 4472921) 730 uracete (30T 480996, 4461005) 730 uracete (30T 480996, 4461005) 730 uracete (30T 48149, 4443709) 750 dartin de la Vega (30T 48149, 4443709) 750 urace de Perales (30T 480848, 4461005) 730 urace de Perales (30T 480848, 4461005) 750 urace de Perales (30T 386567, 446245) 610 del Prado (30T 386567, 446245) 610 del Manzanares (30T 436780, 4533579) 1121 de de la Vega (30T 436780, 4533622) 1810 o de Navafría (30T 449536, 459840) 1050 vacaca de Montejo (30T 446546, 4598380) 1050 vacaca de Montejo (30T 449536, 4598040) 903 uruelo la Vega (30T 449536, 4598028) 973 uruelo (30T 486622, 4598028) 973 uruelo (30T 456171, 4597179) 993 uruelo (30T 456171, 4597179) 993 uruelo | 1400 Oakwood (Quercus pyrenaica) | 10 | | 889 |
| -8 (30T 433707, 4535206) 1200 -9 (30T 436602, 453374) 1100 da de las Torres (30T 480340, 4472921) 730 da de las Fuentes (30T 480996, 4460577) 730 uracete (30T 480996, 44600577) 730 dartin de la Vega (30T 48182, 443709) 750 dartin de la Vega (30T 48182, 443709) 750 uneva de Perales (30T 406526, 4467450) 596 uneva de Perales (30T 406526, 4467450) 596 uneva de Perales (30T 386567, 445281) 660 uneva de Prado (30T 386567, 445281) 660 uneva de Prado (30T 386567, 445281) 660 uneva de Prado (30T 386567, 445281) 660 uneria (30T 399023, 4482478) 922 es Viejas (30T 436780, 4533579) 1121 de Manzanares (30T 436780, 4533579) 1121 de Manzanares (30T 436780, 4533579) 1121 do de Navafría (30T 436780, 453624) 1710 do de la Vega (30T 446367, 4598380) 1050 vacaca de Montejo (30T 44636, 4598380) 1050 vacaca de Montejo (30T 44636, 4598128) 1057 ejo de la Vega (30T 44636, 4598128) 1057 ejo de la Vega (30T 44636, 4598034) 903 rruelo (30T 445652, 4598038) 903 rruelo (30T 456171, 4597179) 993 rruelo (30T 456171, 4597179) 903 | 1300 Oakwood (Quercus pyrenaica) | 10 | | 629 |
| -9 (30T 436602, 453374) 1100 da de las Torres (30T 480340, 4472921) 730 da de las Fuentes (30T 480946, 4467550) 810 on racete (30T 480996, 4460577) 730 racete (30T 480996, 4460577) 730 racete (30T 48149, 4443709) 750 dartín de la Vega (30T 468149, 4443709) 750 rueva de Perales (30T 406526, 4467450) 596 rueva de Perales (30T 406526, 4467450) 596 rueria (30T 386567, 445284) 610 de Prado (30T 386567, 445284) 610 de Prado (30T 386567, 445284) 610 de Manzanares (30T 49714, 4497334) 1020 ya B (30T 436780, 4533579) 1121 de Manzanares (30T 436780, 4533579) 1121 de Manzanares (30T 436780, 4533579) 1121 do de Navafría (30T 436780, 481102) 971 o de Navacerrada (30T 449734, 481102) 971 do de la Vega (30T 44640, 4599328) 1050 ovacas de Montejo (30T 446536, 4598040) 1081 ovacas de Montejo (30T 449536, 4598040) 903 ruelo la Vega (30T 445652, 4598028) 973 ruelo (30T 456171, 4597179) 993 ruelo (30T 456171, 4597179) 993 ruelo | 1200 Cleared Oakwood (Quercus pyrenaica) | 10 | | 638 |
| da de las Torres (30T 480340, 4472921) 730 da de las Fuentes (30T 48040, 4472921) 730 racete (30T 480996, 4460577) 730 racete (30T 480896, 4461005) 730 laguna (30T 480896, 4461005) 730 racete (30T 480896, 4461005) 730 raciosa de Odón (30T 486182, 4453188) 620 rueva de Perales (30T 40450, 4464450) 540 rueva de Perales (30T 40450, 4464450) 540 rueva de Perales (30T 386567, 4459281) 660 rineria (30T 380567, 4459281) 660 rineria (30T 380587, 4459281) 660 rineria (30T 399023, 4482478) 922 res Viejas (30T 386780, 4533579) 1121 red Manzanares (30T 424771, 4497334) 1020 va B (30T 426780, 4533579) 1121 o de Navafría (30T 41060, 4536202) 1810 o de la Waina (30T 449546, 4598380) 1050 rvacas de Montejo (30T 446746, 4598380) 1057 ejo de la Vega (30T 446746, 4598380) 1057 ejo de la Vega (30T 449512, 4598128) 1057 ejo de la Vega (30T 449565, 4598034) 903 rruelo (30T 456652, 4598028) 973 rruelo (30T 456652, 4598028) 973 rruelo (30T 456652, 4598028) 903 rruelo (30T 456171, 4597179) 993 rruelo (30T 456171, 4597179) 993 | 1100 Cleared Holm Oakwood (<i>Quercus ilex</i> ssp. ballota) with scattered oaks (<i>Quercus pyrenaica</i>) | 11 | | 682 |
| la de las Torres (30T 480340, 4472921) 730 da de las Fuentes (30T 485437, 4467550) 810 o (30T 480996, 4460577) 730 laguna (30T 480896, 4461005) 750 laguna (30T 480896, 4461005) 750 lartin de la Vega (30T 468149, 4443709) 750 lartin de la Vega (30T 468149, 4443709) 750 lartin de la Vega (30T 406256, 4467450) 596 lartin de la Vega (30T 40626, 4467450) 596 del Prado (30T 386567, 445281) 660 del Prado (30T 386567, 445281) 660 del Prado (30T 390923, 4482478) 922 es Viejas (30T 452686, 4529060) 905 es Viejas (30T 424771, 4497334) 1020 a B (30T 436780, 4533579) 1121 de Manzanares (30T 424771, 4497334) 1020 a B (30T 436782, 4525428) 1440 corial (30T 399940, 4481102) 971 o de Navafría (30T 44640, 4599328) 996 esjo de la Vega (30T 446440, 4599328) 1057 vacas de Montejo (30T 449536, 4598034) 1057 vacas de Montejo (30T 449536, 4598034) 902 sip de la Vega (30T 445652, 4598038) 973 ruelo (30T 456652, 4598038) 973 ruelo (30T 456652, 4598038) 973 ruelo (30T 456171, 4597179) 933 ruelo (30T 450181, 45981779) 903 | | | | |
| ade las Fuentes (30T 485437, 4467550) 810 oracete (30T 480996, 4460577) 730 laguna (30T 480996, 4461005) 730 laguna (30T 480996, 4461005) 730 laguna (30T 480896, 4461005) 750 lartin de la Vega (30T 496182, 4453188) 620 viciosa de Odón (30T 419855, 447309) 750 del Prado (30T 406266, 4464245) 640 del Prado (30T 386567, 445281) 660 del Prado (30T 386567, 445281) 660 del Prado (30T 386567, 445281) 660 del Manzanares (30T 452686, 4529060) 905 ra A de Manzanares (30T 424771, 4497334) 1020 va B (30T 436780, 4533579) 1121 de Manzanares (30T 424771, 4497334) 1020 va B (30T 436782, 4525428) 1440 ororial (30T 399940, 4481102) 971 ode Navacerrada (30T 4403507, 4506344) 1710 de de la Vega (30T 44640, 4599328) 996 sio de la Vega (30T 44640, 4599328) 1057 vacas de Montejo (30T 449536, 4598040) 1081 vacas de Montejo (30T 445652, 4598038) 903 ruelo (30T 456652, 4598038) 903 ruelo (30T 456652, 4598028) 973 ruelo (30T 456652, 4598028) 903 ruelo (30T 456051, 4598128) 903 ruelo (30T 450171, 4597179) 903 ruelo | 730 | 13 | | 404 |
| o (30T 480996, 4460577) 730 laguna (30T 480896, 4461005) 730 laguna (30T 480896, 4461005) 730 laguna (30T 480896, 4461005) 750 lartin de la Vega (30T 46819, 4443709) 750 liciosa de Odón (30T 419855, 4473962) 540 menta (30T 404566, 4464245) 610 del Prado (30T 38656, 4464245) 660 del Prado (30T 38656, 4464245) 660 del Prado (30T 38656, 446245) 610 del Manzanares (30T 397145, 4465864) 515 ces Viejas (30T 3797145, 4465864) 515 ces Viejas (30T 424771, 4497334) 1020 del Manzanares (30T 424771, 4497334) 1020 del Manzanares (30T 428653, 4525428) 1440 ociorial (30T 389940, 4481102) 971 ociorial (30T 486780, 4533579) 1121 do de la Wina (30T 446404, 4598380) 1050 ociorial (30T 446404, 4598380) 1050 vacas de Montejo (30T 446404, 4598380) 1057 vacas de Montejo (30T 449536, 4598040) 1081 vacas de Montejo (30T 449536, 4598038) 1057 vacas de Montejo (30T 445652, 4598038) 973 ruelo (30T 456652, 4598038) 973 ruelo (30T 456652, 4598038) 973 ruelo (30T 456051, 4598128) 993 ruelo (30T 456051, 4598044) 903 ruelo | 810 | 13 | 20 6 | 467 |
| laguna (30T 480896, 4461005) 730 laguna (30T 480149, 4443709) 750 lartín de la Vega (30T 468149, 4443709) 750 uneva de Perales (30T 468182, 4453188) 620 viciosa de Odón (30T 419855, 4473962) 540 manta (30T 406526, 4467450) 596 manta (30T 307 404260, 4464245) 610 del Prado (30T 307 404260, 4464245) 610 del Prado (30T 309023, 4482478) 922 est Viejas (30T 436786, 4529060) 905 ser Viejas (30T 424771, 4497334) 1020 de Manzanares (30T 424771, 4497334) 1020 corial (30T 399940, 4481102) 971 o de Navaérrada (30T 436786, 4559202) 1810 o de la Vega (30T 446246, 4598380) 1050 de la Vega (30T 449536, 4598428) 1057 vacas de Montejo (30T 449536, 4598426) 901 sio de la Vega (30T 450328, 4599426) 903 ruelo (30T 456052, 4598028) 973 ruelo (30T 450171, 4597179) 903 ruelo | 730 Mesomediterranean Holm Oakwood (<i>Quercus ilex</i> ssp <i>ballota</i>) on limestones | 13 | | 446 |
| laguna (30T 468149, 4443709) 750 Mesomed lartín de la Vega (30T 456182, 4453188) 620 Mesomed uneva de Perales (30T 419855, 4473962) 540 Mesomed annta (30T 419855, 4473962) 540 Mesomed annta (30T 404260, 4464245) 610 Mesomed del Prado (30T 397145, 445284) 610 Mesomed cellilas de la Oliva (30T 397145, 445864) 515 Mesomed cellilas de la Oliva (30T 397145, 445864) 515 Mesomed cellilas de la Oliva (30T 397145, 445864) 515 Mesomed cellilas de la Oliva (30T 436780, 4533579) 1121 Supramec (30T 424771, 4497334) 1020 Supramec corrial (30T 436780, 4533579) 1121 Supramec (30T 436780, 453428) 1440 Supramec (30T 436780, 4536202) 1810 Oromedit of de la Vega (30T 44640, 4599328) 971 Oromedit of de la Vega (30T 44640, 4599328) 1050 Herbaceo coiso de la Vega (30T 449536, 458880) 1050 Herbaceo coiso de la Vega (30T 449536, 45898128) 1057 Jumiper ficacas de Montejo (30T 449536, 45898128) 1057 Jumiper ficacas de Montejo (30T 456122, 4589828) 1057 Jumiper ficacas de Montejo (30T 4561212, 4589828) 1057 Jumiper ficacas de Montejo (30T 4561212, 4589828) 1057 Jumiper ficacas de Montejo (30T 450328, 45899426) 901 Holm Oal ficacas de Montejo (30T 450328, 45899426) 901 Holm Oal ficacas de Montejo (30T 450328, 45899426) 901 Holm Oal ficacas de Montejo (30T 450328, 45899426) 901 Holm Oal ficacas de Montejo (30T 450328, 45899426) 901 Holm Oal ficacas de Montejo (30T 450328, 45899426) 901 Holm Oal ficacas de | 730 Mesomediterranean Holm Oakwood (Quercus ilex ssp ballota) on gypsum and marlstones | 14 | 20 7 | 468 |
| lartín de la Vega (30T 456182, 4453188) 620 viciosa de Odón (30T 419855, 4473962) 540 nueva de Perales (30T 406526, 4467450) 596 nanta (30T 404260, 4464245) 610 del Prado (30T 307397145, 445884) 515 edillas de la Oliva (30T 399023, 4482478) 922 es Viejas (30T 436780, 4533579) 1121 de Manzanares (30T 436780, 4533579) 1121 de Manzanares (30T 424711, 4497334) 1020 corial (30T 399940, 4481102) 971 o de Navaérita (30T 436780, 4536202) 1810 o de la Vega (30T 44640, 4599328) 996 sio de la Vega (30T 44656, 4598380) 1050 vacas de Montejo (30T 446756, 4598380) 1057 vacas de Montejo (30T 450328, 4599426) 901 sio de la Vega (30T 450328, 4599426) 903 ruelo (30T 450171, 4597179) 903 ruelo (30T 450171, 4597179) 903 ruelo | 750 Mesomediterranean Holm Oakwood (<i>Quercus ilex</i> ssp <i>ballota</i>) on gypsum and marlstones | 14 | | 454 |
| iciosa de Odón (30T 419855, 4473962) 540 nueva de Perales (30T 406526, 4467450) 596 nanta (30T 404260, 4464245) 610 del Prado (30T 307145, 4458281) 660 neria (30T 397145, 446864) 515 edillas de la Oliva (30T 399023, 4482478) 922 es Viejas (30T 426771, 449734) 1020 de Manzanares (30T 424771, 449734) 1020 corial (30T 42863, 4525428) 1440 corial (30T 42863, 4525428) 1440 corial (30T 42863, 4525428) 1440 corial (30T 439976, 4519462) 1711 do de la Wega (30T 44640, 4599328) 996 ejo de la Vega (30T 44640, 4599328) 1057 vacas de Montejo (30T 449536, 4598400) 1081 vacas de Montejo (30T 449536, 4598426) 901 eiglo de la Vega (30T 450328, 4599426) 901 enelo (30T 456652, 45988028) 973 ruelo (30T 456652, 4598028) 973 ruelo (30T 456051, 4591779) 993 ruelo (30T 450171, 4597179) 903 | 620 Mesomediterranean Holm Oakwood (<i>Quercus ilex</i> ssp ballota on gypsum and marlstones | 14 | 21 8 | 443 |
| uueva de Perales (30T 406526, 4467450) 596 nanta (30T 404260, 4464245) 610 del Prado (30T 386567, 4459281) 660 neria (30T 397145, 4465864) 515 edillas de la Oliva (30T 397145, 4465864) 515 edillas de la Oliva (30T 399023, 4482478) 922 es Viejas (30T 452686, 452060) 905 a A (30T 436780, 4533579) 1121 de Manzanares (30T 424771, 4497334) 1020 a B (30T 424771, 4497334) 1020 corial (30T 436783, 4525428) 1440 octa Navaérria (30T 431060, 4536202) 1810 o de Navaérria (30T 441976, 4519462) 1711 do de la Vega (30T 446756, 4598380) 1050 ejo de la Vega (30T 446756, 4598380) 1050 vacas de Montejo (30T 449536, 4598428) 1057 vacas de Montejo (30T 450328, 4599426) 901 ejo de la Vega (30T 456352, 45988028) 973 ruelo (30T 456652, 4598028) <t< td=""><td>540 Mesomediterranean Holm Oakwood (Quercus ilex ssp ballota) on sands</td><td>14</td><td></td><td>537</td></t<> | 540 Mesomediterranean Holm Oakwood (Quercus ilex ssp ballota) on sands | 14 | | 537 |
| del Prado (30T 404266, 4464245) 610 del Prado (30T 386567, 4459281) 660 neria (30T 397145, 4465864) 515 edillas de la Oliva (30T 397145, 4465864) 515 edillas de la Oliva (30T 399023, 4482478) 922 es Viejas (30T 452686, 452060) 905 a A (30T 436732, 4533732) 1121 de Manzanares (30T 424771, 4497334) 1020 a B (30T 436732, 4533732) 1295 orial (30T 436732, 453342) 1440 orde Navaérira (30T 431060, 4536202) 1810 o de Navaérira (30T 441976, 4519462) 1711 do de la Vega (30T 44640, 4599328) 996 ejo de la Vega (30T 446756, 4598380) 1050 vacas de Montejo (30T 449536, 4598428) 1057 vacas de Montejo (30T 450328, 4599426) 901 ejo de la Vega (30T 450328, 4599426) 901 zipo de la Vega (30T 456032, 4598028) 973 ruelo (30T 456052, 4598028) | 596 Mesomediterranean Holm Oakwood (<i>Quercus ilex</i> ssp <i>ballota</i>) on sands | 15 | 21 9 | 559 |
| del Prado (30T 386567, 4459281) 660 neria (30T 397145, 4465864) 515 edillas de la Oliva (30T 399023, 4482478) 922 es Viejas (30T 452686, 4529060) 905 a A (30T 436780, 453379) 1121 de Manzanares (30T 424771, 4497334) 1020 a B (30T 428673, 4533732) 1295 orcial (30T 428653, 4525428) 1440 orde Navafría (30T 439940, 4481102) 971 o de Navacerrada (30T 44640, 4599328) 996 ejo de la Vega (30T 44640, 4599328) 1050 vacas de Montejo (30T 449536, 45984380) 1050 vacas de Montejo (30T 449536, 4598428) 1057 sio de la Vega (30T 449536, 4598428) 1057 vacas de Montejo (30T 450328, 4599426) 901 sio de la Vega (30T 450328, 4599426) 901 sio de la Vega (30T 450328, 4599426) 901 sio de la Vega (30T 456652, 4598028) 973 ruelo (30T 450511, 4597179) 933 ruelo (30T 450511, 4597179) 903 | 610 Mesomediterranean Holm Oakwood (Quercus ilex ssp ballota) on sands | 15 | 21 9 | 528 |
| neria (30T 397145, 4465864) 515 edillas de la Oliva (30T 399023, 4482478) 922 es Viejas (30T 452686, 4529060) 905 a A (30T 436780, 4533579) 1121 de Manzanares (30T 424771, 4497334) 1020 a B (30T 424771, 4497334) 1020 corial (30T 428653, 4525428) 1440 corial (30T 428653, 4526428) 1440 corial (30T 439940, 4481102) 971 co de Navacerrada (30T 419976, 4519462) 1711 do de la Wega (30T 446440, 4599328) 996 ejo de la Vega (30T 446756, 4598380) 1050 vacas de Montejo (30T 446756, 4598128) 1057 coas de Montejo (30T 446736, 4598128) 1057 coas de Montejo (30T 446736, 4598128) 1057 coas de Montejo (30T 450328, 4599426) 901 el o de la Vega (30T 450328, 4599426) 901 el o de la Vega (30T 450328, 4599426) 901 el o de la Vega (30T 450121, 4598128) 1057 cuelo (30T 450171, 4597179) 933 cuelo (30T 450151, 4598149) 903 | 660 Mesomediterranean Holm Oakwood (<i>Quercus ilex ssp ballota</i>) on granites | 15 | | 589 |
| edillas de la Oliva (30T 399023, 4482478) 922 es Viejas (30T 452686, 4529060) 905 a A (30T 436780, 4533579) 1121 de Manzanares (30T 424771, 4497334) 1020 a B (30T 424771, 4497334) 1020 corial (30T 428653, 4525428) 1440 corial (30T 428653, 4526202) 1810 o de Navacriada (30T 419976, 4519462) 1711 a) de la Wega (30T 446440, 4599328) 996 e) de la Vega (30T 446440, 4599328) 1050 vacas de Montejo (30T 44656, 4598128) 1057 e) de la Vega (30T 44654, 4598128) 1057 e) de la Vega (30T 44654, 4598128) 1057 e) de la Vega (30T 44656, 4598128) 1057 e) de la Vega (30T 450328, 4599426) 901 e) de la Vega (30T 456652, 4598038) 973 e) cuelo (30T 456652, 4598028) 973 e) cuelo (30T 450171, 4597179) 930 e) cuelo (30T 450161, 4598179) 933 e) cuelo | 515 Mesomediterranean Holm Oakwood (Quercus ilex ssp ballota) on granites | 16 | | 573 |
| es Viejas (30T 452686, 4529060) 905 a A (30T 436780, 4533579) 1121 de Manzanares (30T 424771, 4497334) 1020 a B (30T 424771, 4497334) 1020 a B (30T 424771, 4497334) 1020 corial (30T 428653, 4525428) 1440 corial (30T 428653, 4526202) 1810 o de Navafría (30T 419976, 4519462) 1711 a) de la Vega (30T 446440, 4599328) 996 e) de la Vega (30T 44656, 4598380) 1050 vacas de Montejo (30T 449536, 4598428) 1057 sjo de la Vega (30T 449536, 4598428) 901 sjo de la Vega (30T 450328, 4599426) 901 sjo de la Vega (30T 456652, 4598038) 902 ruelo (30T 456652, 4598028) 973 ruelo (30T 456652, 4598028) 973 ruelo (30T 450171, 4597179) 930 ruelo (30T 450051, 4598944) 903 | 922 Mesomediterranean Holm Oakwood (Quercus ilex spp ballota) on granites | 12 | 18 6 | 199 |
| de Manzanares (30T 436780, 4533579) 1121 de Manzanares (30T 424771, 4497334) 1020 a B (30T 424771, 4497334) 1020 a B (30T 424771, 4497334) 1020 corial (30T 428653, 4525428) 1440 corial (30T 428653, 452622) 1810 o de Navacrrada (30T 419976, 4519462) 1711 do de la Vega (30T 446440, 4599328) 996 ejo de la Vega (30T 446756, 4598380) 1050 vacas de Montejo (30T 446736, 4598128) 1057 sjo de la Vega (30T 44536, 4599426) 901 sjo de la Vega (30T 456022, 4599426) 901 sjo de la Vega (30T 456022, 4599428) 902 ruelo (30T 456652, 4599034) 903 ruelo (30T 456051, 4599179) 930 ruelo (30T 452051, 4598149) 903 | 905 Supramediterranean Holm Oakwood (Quercus ilex ssp ballota) on granites | 12 | | 550 |
| de Manzanares (30T 424771, 4497334) 1020 da B (30T 436732, 4533732) 1295 orcuera (30T 428653, 4525428) 1440 sorial (30T 428654, 481102) 971 ode Navacfira (30T 431060, 4536202) 1810 ode Navacerrada (30T 449976, 4519462) 1711 do de la Vega (30T 446440, 4599328) 996 ejo de la Vega (30T 446756, 4598380) 1050 vacas de Montejo (30T 449536, 45984128) 1057 sjo de la Vega (30T 44912, 4598128) 1057 sjo de la Vega (30T 456652, 4599426) 901 sjo de la Vega (30T 456652, 4599426) 901 sjo de la Vega (30T 45652, 4599426) 901 sjo de la Vega (30T 456171, 4597179) 930 ruelo (30T 452051, 4598149) 933 ruelo (30T 452051, 4598944) 903 | 1121 Supramediterranean Holm Oakwood (Quercus ilex ssp ballota) on granites | 11 | | 652 |
| a B (30T 436732, 4533732) 1295 orcuera (30T 428653, 4525428) 1440 corial (30T 399940, 4481102) 971 o de Navaérira (30T 431060, 4536202) 1810 o de la Wavacerrada (30T 4419976, 4519462) 1711 do de la Vega (30T 446440, 4599328) 996 ejo de la Vega (30T 446540, 4599328) 1050 vacas de Montejo (30T 449536, 4598409) 1081 vacas de Montejo (30T 449212, 4598128) 1057 sjo de la Vega (30T 451196, 4599426) 901 sjo de la Vega (30T 456522, 4598028) 973 ruelo (30T 456171, 4597179) 930 ruelo (30T 452051, 4598944) 903 | 1020 Supramediterranean Holm Oakwood (Quercus ilex ssp ballota) on granites | 12 | | 229 |
| ore la Navafría (30T 428653, 4525428) 1440 corial (30T 399940, 4481102) 971 o de Navafría (30T 431060, 4536202) 1810 o de Navacerrada (30T 419976, 4519462) 1711 do de la Mina (30T 4403507, 4506344) 1710 cipi de la Vega (30T 446440, 4599328) 996 cipi de la Vega (30T 446546, 4598380) 1050 vacas de Montejo (30T 449536, 4598040) 1081 vacas de Montejo (30T 449536, 4598048) 1057 cipi de la Vega (30T 450328, 4599426) 901 cipi de la Vega (30T 456652, 4598034) 902 ruelo (30T 456652, 4598028) 973 ruelo (30T 456171, 4597179) 930 ruelo (30T 450171, 4597179) 930 | 1295 Supramediterranean Oakwood (Quercus pyrenaica) on granites | 10 | | 969 |
| corial (30T 399940, 4481102) 971 o de Navafría (30T 431060, 4536202) 1810 o de Navacerrada (30T 4319976, 4519462) 1711 do de la Mina (30T 403507, 4506344) 1710 cijo de la Vega (30T 446440, 4599328) 996 cijo de la Vega (30T 446756, 4598380) 1050 vacas de Montejo (30T 449536, 4598040) 1081 vacas de Montejo (30T 449212, 4598128) 1057 cijo de la Vega (30T 450328, 4599034) 901 cijo de la Vega (30T 450429, 4599034) 902 ruelo (30T 456652, 4598028) 973 ruelo (30T 456119, 4597179) 930 ruelo (30T 450171, 4597179) 930 | 1440 Supramediterranean Oakwood (<i>Quercus pyrenaica</i>) on granites | 6 | | 922 |
| o de Navafría (30T 431060, 4536202) 1810 o de Navacerrada (30T 419976, 4519462) 1711 do de la Mina (30T 409507, 4506344) 1710 de la Vega (30T 446440, 4599328) 996 sio de la Vega (30T 446756, 4598380) 1050 vacas de Montejo (30T 449536, 4598040) 1081 vacas de Montejo (30T 449212, 4598128) 1057 sio de la Vega (30T 450328, 4599426) 901 sio de la Vega (30T 450328, 4599034) 902 ruelo (30T 456652, 4598028) 973 ruelo (30T 456171, 4597179) 930 ruelo (30T 450511, 4597179) 930 | 971 Supramediterranean Oakwood (Quercus pyrenaica) on granites | 12 | | 863 |
| o de Navacerrada (30T 419976, 4519462) 1711 do de la Mina (30T 403507, 4506344) 1710 sjo de la Vega (30T 446440, 4599328) 996 sjo de la Vega (30T 446756, 4598380) 1050 vacas de Montejo (30T 449536, 4598040) 1081 vacas de Montejo (30T 449512, 4598128) 1057 sjo de la Vega (30T 450328, 4599426) 901 sjo de la Vega (30T 450328, 4599034) 902 ruelo (30T 456652, 4598028) 973 ruelo (30T 456171, 4597179) 930 ruelo (30T 452051, 4598944) 903 | 1810 Oromediterranean Scot's pine forest (<i>Pinus sylvestris</i>) on granites | 8 | | 791 |
| to de la Mina (30T 403507, 4506344) 1710 sio de la Vega (30T 446440, 4599328) 996 sio de la Vega (30T 446756, 4598380) 1050 vacas de Montejo (30T 449536, 4598040) 1081 vacas de Montejo (30T 449212, 4598128) 1057 sio de la Vega (30T 450328, 4599426) 901 sio de la Vega (30T 450328, 4599034) 902 ruelo (30T 456652, 4598028) 973 ruelo (30T 456171, 4597179) 930 ruelo (30T 45051, 4598944) 903 | 1711 Oromediterranean Scot's pine forests (<i>Pinus sylvestris</i>) on granites | ∞ | 13 2 | 896 |
| ejo de la Vega (30T 446440, 4599328) 996 egio de la Vega (30T 446756, 4598380) 1050 vacas de Montejo (30T 449536, 4598040) 1081 . vacas de Montejo (30T 449212, 4598128) 1057 . ejo de la Vega (30T 450328, 4599426) 901 . eio de la Vega (30T 451196, 4599034) 902 . eruelo (30T 456652, 4598028) 973 . eruelo (30T 456171, 4597179) 930 . eruelo (30T 452051, 459844) 903 | 1710 Oromediterranean Scot's pine forests (<i>Pinus sylvestris</i>) on granites | ∞ | | 752 |
| (30T 446440, 4599328) 996 (30T 446756, 4598380) 1050 (30T 449536, 4598040) 1081 . (30T 449212, 4598128) 1057 . (30T 450328, 4599426) 901 (30T 451196, 4599034) 902 (30T 45652, 4598028) 973 (30T 456171, 4597179) 930 (30T 452051, 4598944) 903 | | | | |
| (30T 446756, 4598380) 1050 (30T 449536, 4598040) 1081 . (30T 449212, 4598128) 1057 . (30T 450328, 4599426) 901 (30T 451196, 4599034) 902 (30T 45652, 4598028) 973 (30T 456171, 4597179) 930 (30T 452051, 4598944) 903 | 996 Herbaceous and shrub vegetation | 12 | | 521 |
| (30T 449536, 4598040) 1081. (30T 449212, 4598128) 1057. (30T 450328, 4599426) 901. (30T 451196, 4599034) 902. (30T 45652, 4598028) 973. (30T 456171, 4597179) 930. (30T 452051, 4598944) 903. | 1050 Herbaceous and shrub vegetation | ======================================= | | 451 |
| (30T 449212, 4598128) 1057 (30T 450328, 4599426) 901 (30T 451196, 4599034) 902 (30T 45652, 4598028) 973 (30T 456171, 4597179) 930 (30T 452051, 4598944) 903 | 1081 Juniper forest (Juniperus thurifera) | 11 | | 517 |
| (30T 450328, 4599426) 901 (30T 451196, 4599034) 902 (30T 456652, 4598028) 973 (30T 456171, 4597179) 930 (30T 452051, 4598944) 903 | 1057 Juniper forest (Juniperus thurifera) | = | | 499 |
| (30T 451196, 4599034) 902 (30T 456652, 4598028) 973 (30T 456171, 4597179) 930 (30T 452051, 4598944) 903 | 901 Holm Oakwood (<i>Quercus ilex ssp ballota</i>) | 12 | | 520 |
| (30T 456652, 4598028) 973 (30T 456171, 4597179) 930 (30T 452051, 4598944) 903 | 902 Holm Oakwood (Quercus ilex ssp ballota) | 12 | | 521 |
| (30T 456171, 4597179) 930 (30T 452051, 4598944) 903 | 973 Lusitanian Oakwood (<i>Quercus faginea</i>) | 12 | | 454 |
| (30T 452051, 4598944) 903 Riparian | 930 Lusitanian Oakwood (<i>Quercus faginea</i>) | 12 | | 453 |
| | 903 Riparian forest (Populus nigra) | 12 | 18 5 | 476 |
| 40) Maderuelo (30T 453316, 4598375) 899 Riparian forest (<i>Populus nigra</i>) | 4598375) 899 Riparian forest (<i>Populus nigra</i>) | 12 | | 468 |

Table 2. List of species caught on carrion-baited traps in each survey. OCC: number of occurrences; IND: total number of individuals; MAX: maximum n. of individuals per trap. Numbers that identify the localities are the same as reflected in table 1.

| 0CC IND MAX OCC IND MAX OCC IND MAX OCC IND 2 | 2 2 2 1 16 329 12 13 489 12 3 392 1 2 29 1 1 489 12 1 392 1 2 2 1 1 1 1 1 392 10 - | | 0. | Survey | | | Survey 2 | | | Survey | ž | |
|--|--|--|----|--------|-----|----|-----------------|----|----------|--|----|--|
| 89) 1 | 2 2\$ 2\$ 1 16 32\$ 12 13 48\$ 12 3 3 3\$ 1 | | | IND | MAX | | | | | | | Localities |
| 89) 1 | 89) 1 | HYMENOPTERA - APOIDEA | | | | | | | | | | |
| 2 22 1 1 16 322 12 13 482 12 13 3 487 12 13 3 3 4 12 1 3 3 4 12 1 3 3 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 89) 1 | Family APIDAE | | | | | | | | | | |
| 3 39 1 1 2 29 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 3 34 1 2 2 2 1 | Apis mellifera L. 1758 | 7 | 20 | - | 16 | 32♀ | 12 | 13 | 48¢ | 12 | 3, 4, 10, 13, 14, 16, 19, 23, 31, 32, 34, 37, 38, 39, 40 |
| 3 3 1 2 2 1 1 1 1 40 1 1 1 1 1 1 1 1 1 | 1 39 1 2 29 1 | Bombus hortorum (L. 1761) | ж | 30 | - | ı | | | ı | | | 1, 2, 5 |
| 1 | 789) 1 | Bombus humilis Illiger 1806 | _ | 30 | _ | 7 | 5≎ | _ | 1 | | | 7, 23, 26 |
| 1 | 9 399 10 - 1 19 1 1 30 1 29 2 10 1 19 1 1 1,2,4,5,6,7,31 1 29 2 1 69 5 40 1 1 29 2 14 789) 1 1 29 2 1 19 1 1 14 789) 1 1 19 1 1 24 2 3,10,14,17,32,39,40 1 1 19 1 1 4 49 1 3 49 2 3,10,14,17,32,39,40 1 1 19 1 1 4 49 1 3 49 2 3,10,14,17,32,39,40 1 1 19 1 1 4 49 1 3 49 2 3,10,14,17,32,39,40 1 1 19 1 1 4 49 1 3 49 2 3,10,14,17,32,39,40 1 1 19 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | Bombus laesus Morawitz 1875 | | , | | 1 | | | 1 | 0+ | - | 40 |
| 9 39\$ 10 1 1 1\$\frac{1}{2}\$ 1 1,24,5,6,7,31 1 2\$\frac{1}{2}\$ 2 2 6\$\frac{1}{2}\$ 5 40 1 2\$\frac{1}{2}\$ 2 6 889) 1 1 1\$\frac{1}{2}\$ 1 14 889) 1 1 1\$\frac{1}{2}\$ 1 1 1 2\$\frac{1}{2}\$ 2 14 881) 1 1 1\$\frac{1}{2}\$ 1 1 1 1\$\frac{1}{2}\$ 3 36,40 1 1 1\$\frac{1}{2}\$ 1 1 1 1\$\frac{1}{2}\$ 3 36,40 1 1 1\$\frac{1}{2}\$ 1 1 1 1\$\frac{1}{2}\$ 4 37 1 1 1\$\frac{1}{2}\$ 1 1 1 1\$\frac{1}{2}\$ 3 36,40 1 1 1\$\frac{1}{2}\$ 1 1 1 1\$\frac{1}{2}\$ 3 36,40 1 1 1\$\frac{1}{2}\$ 1 1 1 1\$\frac{1}{2}\$ 3 36,10 1 2 2 3\$\frac{1}{2}\$ 2 3 3 35,10 2 3 3\$\frac{1}{2}\$ 2 3 3 35,10 2 4 37 2 5 10,12,32,34,37 2 1 1 1\$\frac{1}{2}\$ 1 13,14 7,19,20 3 13,23,33,34,35,39 4 10 17\$\frac{1}{2}\$ 1 0 10,14,17,20 6 13\$\frac{1}{2}\$ 4 10 17\$\frac{1}{2}\$ 4 0 10,14,17,20 6 13\$\frac{1}{2}\$ 4 10 17\$\frac{1}{2}\$ 4 0 10,11,12,13,14,16,19,20 1 1 1\$\frac{1}{2}\$ 1 1 14 2\$\frac{1}{2}\$ 17\$\frac{1}{2}\$ 4 10,11,12,13,14,16,19,20 1 1 1\$\frac{1}{2}\$ 1 1 14 2\$\frac{1}{2}\$ 17\$\frac{1}{2}\$ 4 10,11,12,13,14,16,19,20 1 1 1\$\frac{1}{2}\$ 1 11,13,17,12,12,13,14,16,19,20 1 1 1\$\frac{1}{2}\$ 1 11,15,22 1 1 1\$\frac{1}{2}\$ 1 1 | 9 399 10 1 1 19 1 1,2,4,5,6,7,31 1 2 | Bombus magnus Vogt 1911 | | | | 1 | 0+ | - | 1 | | | 30 |
| 89) 1 | 1 2\psi 2 2 1 2 2 5 40 1 2\psi 2 2 1 2 2 5 40 1 2\psi 2 1 1 2 1 1 1 1 1 2\psi 2 1 1 2 1 1 1 1 2\psi 2 1 1 2 1 1 1 1 2\psi 2 1 1 2 2 3 3 3 40 1 2\psi 2 3 3 3 3 40 1 2\psi 2 3 3 3 3 40 1 2\psi 3 3 3 3 40 1 3 3 3 3 3 3 3 1 3 3 3 3 3 3 1 3 3 3 3 3 3 1 3 3 3 3 3 3 1 3 3 3 3 3 1 3 3 3 3 3 1 3 3 3 3 3 1 3 3 3 3 1 3 3 3 3 1 3 3 3 3 1 3 3 3 3 1 3 3 3 3 1 3 3 3 3 1 3 3 3 3 1 3 3 3 3 1 3 3 3 3 1 3 3 3 3 1 3 3 3 3 1 3 3 3 3 1 3 3 3 1 3 3 3 1 3 3 3 1 3 3 3 1 3 3 3 1 3 3 3 1 3 3 3 1 3 3 3 1 3 3 3 1 3 | Bombus pascuorum (Scopoli 1763) | 6 | 39♀ | 10 | ı | ı | | - | 0+ | - | 1, 2, 4, 5, 6, 7, 31 |
| 1 24 2 - - 1 19 1 - - - 14 1 29 2 - - 14 1 19 1 - - - 14 1 19 1 - - - 14 1 19 1 - - - 1 19 1 - - - 1 19 1 - - - 1 19 1 - - - 1 19 1 - - 1 19 1 4 49 1 3 49 2 3,10,14,17,32,39,40 1 19 1 4 49 1 3 49 2 3,10,14,17,32,39,40 1 19 1 1 1 1 1 1 1 1 | 1 2 | Bombus sylvarum (L. 1761) | , | | 1 | 1 | | | 7 | 59 | 5 | 40 |
| 89) | 14 | Bombus terrestris (L. 1758) | _ | 2 | 7 | , | | | , | | | 9 |
| 89) | 89) 1 1\frac{2}{2} 2 - - 14 1 1\frac{2}{2} 2 - - 13 1 1\frac{2}{2} 2 3.10,14,17,32,39,40 1 1\frac{2}{2} 3 3 3 3 3 3 3 3 3 | Family ANTHOPHORIDAE | | | | | | | | | | |
| 89) | 89) | Amegilla albigena (Lepeletier 1841) | , | , | , | _ | <u></u> | - | , | | , | 14 |
| 789) | 789) 1 1 1 1 1 1 1 1 1 1 1 | Amegilla ochroleuca (Perez 1879) | | | ı | _ | 20 | 7 | ı | | | 14 |
| 1 19 1 1 1 1 1 1 1 1 | 1 1\$\rightarrow{\psi} 1 1 \rightarrow{\psi} 1 1 \rightarro | Amegilla quadrifasciata (de Villers 1789) | ı | | | - | <u>+</u> | _ | ı | | | 13 |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$ | 841) $ \begin{array}{ccccccccccccccccccccccccccccccccccc$ | Anthophora furcata (Panzer 1798) | _ | 10 | - | 1 | | | 1 | | | |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $ \begin{array}{cccccccccccccccccccccccccccccccccccc$ | Family MEGACHILIDAE | | | | | | | | | | |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | 841) 2 1\hat{6}, 3\hat{9} \text{ 3 6, 40} 1 1\hat{9} 1 40 1 1 4\hat{9} 4 37 1 1 1\hat{9} 1 40 2 3\hat{9} 2 3 3\hat{6}, 1\hat{9} 2 10, 12, 32, 34, 37 1 1 1\hat{9} 1 2 2 1 1 1\hat{9} 1 2 2 1 1 1\hat{9} 1 2 9 10\hat{6}, 95\hat{9} 52 31, 32, 33, 34, 35, 39 5 5\hat{9} 1 10, 14, 17, 19, 20 5 5\hat{9} 1 10, 14, 17, 20 5 5\hat{9} 1 6, 7\hat{8} 10, 17, 18, 19, 20, 27 14 2\hat{6}, 17\hat{9} 4 10, 11, 12, 13, 14, 16, 19, 21 14 2\hat{6}, 17\hat{9} 4 10, 11, 15, 17, 12, 19, 20, 21, 23 14 2\hat{6}, 17\hat{9} 1 10, 11, 15, 17, 12, 19, 20, 21, 23 1 1\hat{1} 1\hat{6} 1 11, 15, 12, 19, 20, 21, 23 10, 11, 15, 17, 12, 19, 20, 21, 23 | Megachile pilidens Alfken 1924 | _ | 10 | - | 4 | 4 0+ | _ | ω | 4 | 7 | 3, 10, 14, 17, 32, 39, 40 |
| 1805) 1 1 $\frac{4}{4}$ 4 37 tier 1841) 1 1 $\frac{4}{4}$ 4 37 tier 1841) 1 1 $\frac{4}{4}$ 4 37 806) 1 1 $\frac{4}{4}$ 1 2 2 807 2 3 3 3 , 1 $\frac{2}{3}$ 2 3 3, 34, 35, 39 807 3 6 $\frac{7}{4}$ 2 9 $\frac{10}{3}$, 95 $\frac{2}{4}$ 5 31, 32, 33, 34, 35, 39 908 3 6 $\frac{7}{4}$ 2 13, 14, 17, 19, 20 909 3 $\frac{7}{4}$, 10 17 $\frac{2}{4}$ 1 10, 14, 17, 20 100 11, 12, 13, 14, 16, 19, 21 11 1 $\frac{7}{4}$ 1 11, 15, 22 12 1 1 $\frac{7}{4}$ 1 11, 15, 22 13 1 1 $\frac{7}{4}$ 1 11, 15, 22 14 2 $\frac{7}{4}$, 17 1 11, 15, 22 15 1 1 1 $\frac{7}{4}$ 1 | 1 | Megachile willughbiella (Kirby 1802) | | | | | | | 7 | 13,3 | 33 | 36, 40 |
| tier 1841) 2 $\frac{3}{4}$ 2 $\frac{2}{3}$ 3 $\frac{3}{6}$, 1 $\frac{4}{9}$ 2 $\frac{4}{3}$ 3 $\frac{3}{6}$, 1 $\frac{4}{9}$ 2 $\frac{3}{3}$ 3 $\frac{3}{6}$, 1 $\frac{4}{9}$ 2 $\frac{3}{3}$ 3 $\frac{3}{6}$, 1 $\frac{4}{9}$ 2 $\frac{3}{3}$ 3 $\frac{3}{6}$, 3 $\frac{3}{3}$ 3 $\frac{3}{4}$ 3 $\frac{3}{3}$ 3 $\frac{3}{4}$ 3 $\frac{3}{3}$ 3 $\frac{3}{4}$ | 1805) 1 4\rapprox 4 37 37 31 31 31 31 31 31 | Anthidium florentinum (F. 1775) | | | ı | ı | , | | _ | 10+ | - | 40 |
| letier 1841) 2 3 φ 2 3 3 φ , 1 φ 2 10, 12, 32, 34, 37 1806) 1 1 1 φ 1 9 10 φ , 95 φ 52 31, 32, 34, 35, 39 1806) 6 7 φ 2 9 10 φ , 95 φ 52 31, 32, 33, 34, 35, 39 1806) 6 7 φ 2 13, 14, 17, 19, 20 17 φ 3 1 10, 14, 17, 20 17 φ 4 10, 14, 17, 20 17 φ 3 1 14, 2 φ , 17 φ 4 10, 11, 12, 13, 14, 16, 19, 21 1787) 14, 2 φ , 17 φ 4 10, 11, 15, 17, 19, 20, 21, 16Femüller 1775) 14, 2 φ , 17 φ 4 10, 11, 15, 17, 19, 20, 21, 18, 17, 18, 19, 20, 21, 19, 20, 21, 19, 20, 21, 20, 20, 21, 20, 20, 21, 20, 2 | letier 1841) 2 34 2 2 3 3β , 14 2 10, 12, 32, 34, 37 1806) 1 1 14 1 9 10 β , 95 β 52 31, 32, 33, 43, 53, 99 1806) 6 7ϕ 2 9 10 β , 95 ϕ 52 31, 32, 33, 43, 53, 99 183) 6 7ϕ 2 13, 14, 17, 19, 20 3 | Anthidiellum strigatum (Panzer 1805) | | | | ı | | | - | 4 | 4 | 37 |
| letier [841) 1 1 φ 1 2 2 1806) 1 1 φ 1 2 2 1806) 9 10 φ , 95 φ 52 31, 32, 33, 34, 35, 39 1806) 9 10 φ , 95 φ 52 31, 32, 33, 34, 35, 39 180 13, 14, 17, 19, 20 17 φ 4 10, 14, 17, 20 17 φ 5 10, 14, 17, 20 17 φ 7 10, 14, 17, 20 17 φ 8) 6 13 φ 4 10 17 φ 4 10, 11, 12, 13, 14, 16, 19, 21 17 φ 1 14 2 φ , 17 φ 4 10, 11, 12, 13, 14, 16, 19, 21 17 φ 1 1 φ 1 11, 15, 22 12, 13 12, 13 12, 13 12, 13 13, 14, 16, 19, 20, 21, 20, 20, 21, 2 | letier 1841) 1 $1 + 1$ 1 $ $ | Trachusa interrupta (F. 1781) | 1 | | ı | 7 | 30 | 2 | n | 3♂, 1♀ | 7 | 10, 12, 32, 34, 37 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | Chalicodoma pyrenaica (Lepeletier 1841) | | | | - | 0+ | - | ı | | | 22 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | Family HALICTIDAE | | | | | | | | | | |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | Nomiapis diversipes (Latreille 1806) | , | | | ı | | | 6 | 10 3, 95 $\stackrel{\circ}{\Rightarrow}$ | 52 | |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | LEPIDOPTERA | | | | | | | | | | |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | Family NOCTUIDAE | | | | | | | | | | |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | Catocala conjuncta (Esper 1787) | | | 1 | 9 | 70 | 7 | 1 | | | 13, 14, 17, 19, 20 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | Catocala conversa (Esper 1783) | | • | | 5 | 5⇔ | _ | 1 | | | 10, 14, 17, 20 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | Catocala dilecta (Hübner 1808) | 9 | 13♀ | 4 | 10 | 17♀ | 4 | 1 | | | 6, 7, 8, 10, 17, 18, 19, 20, 27 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | Catocala nymphagoga (Esper 1787) | | | | 6 | 3β , 16 | 9 | 1 | | | 16, 19, |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | Catocala nymphaea (Esper 1787) | | | | 14 | 2♂, 17♀ | 4 | 1 | | | 17, 12, 19, 20, 21, |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | Minucia lunaris (Denis et Schiffermüller 1775) | ı | | | т | 2♂, 1♀ | _ | ı | | | 11, 15, 22 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | Lygephila craccae (Denis et Schiffermüller 1775) | - | 13 | _ | , | , | | , | | | S |
| | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | Acronicta psi (L. 1758) | | 13 | | , | , | | ı | • | , | 8 |
| | 1 13 1 15 | Tyta luctuosa (Denis et Schiffermüller 1775) | 1 | | 1 | 7 | 2♂ | - | 1 | | | 12, 13 |
| | | Caradrina noctivaga Bellier 1863 | | • | | _ | 10% | _ | • | • | | 15 |

(Table 2 Continued)

| / | | Survey | 1 | S | Survey 2 | | S | Survey 3 | | | T ocalities |
|--|-----|----------|-----|-----|----------------|-----|-----|---------------------------|----------|----------------|-------------|
| | OCC | IND | MAX | OCC | IND | MAX | OCC | IND | MAX | | |
| Polyphaenis sericata (Esper 1787) | | , | | _ | 0+ | _ | , | | | 10 | |
| Olivenebula xanthochloris (Boisduval 1840) | _ | 1% | | | | ı | ı | | | 4 | |
| Thalpophila matura (Hufnagel 1766) | | 1 | | | | 1 | _ | 3♂ | α | 32 | |
| Dicycla oo (L. 1758) | _ | 10% | - | , | | ı | ı | | | 8 | |
| Apamea arabs Oberthür 1881 | | 1 | | _ | 10% | - | 1 | | | 21 | |
| Agrochola meridionalis (Staudinger 1871) | | | | - | 10 | 1 | | | | 27 | |
| Omphaloscelis lunosa (Haworth 1809) | , | 1 | | _ | 13 | _ | | | | 20 | |
| Conistra rubiginosa (Scopoli 1763) | | | | - | 13 | - | ı | | | 14 | |
| Jodia croceago (Denis et Schiffermüller 1775) | | | | 1 | 10 | 1 | | | | 25 | |
| Dryobota labecula (Esper 1788) | | | | - | 13 | - | | | | 15 | |
| Ammopolia witzenmanni (Standfuss 1890) | | | | _ | 10 | - | | | | 14 | |
| Trigonophora crassicornis (Oberthür 1918) | | | | ж | 3♂, 1♀ | 2 | | | | 20, 24 | |
| Aporophyla nigra (Haworth 1809) | | | | _ | 2♂ | 7 | | | | 14 | |
| Polymixis argillaceago (Hübner 1822) | | | | 7 | 5⊰ | _ | | | | 15 | |
| Orthosia cruda (Denis et Schiffermüller 1775) | | | | _ | [€] 0 | _ | | | | 25 | |
| Noctua comes Hübner 1813 | | | | | | | - | 13 | | 33 | |
| Chersotis anatolica (Draudt 1936) | _ | 1% | _ | | | | | | | 1 | |
| Xestia kermesina (Mabille 1869) | | | | _ | 13 | | | | | 14 | |
| Xestia xanthographa (Denis et Schiffermüller 1775) | | | | 1 | 13 | 1 | | | | 16 | |
| Euxoa temera (Hübner 1808) | | | | 7 | 2⊰ | | | | | 10, 28 | |
| Euxoa tritici (L. 1761) | - | 10% | П | | | | | | | | |
| Agrotis ipsilon (Hufnagel 1766) | | | | - | ~ | - | | | | 13 | |
| Family ARCTIIDAE | | | | | | | | | | | |
| Eilema palliatella (Scopoli 1763) | - | 10% | _ | | | | | | | 4 | |
| Family NYMPHALIDAE | | | | | | | | | | | |
| Nymphalis polychloros (L. 1758) | - | 10% | - | 4 | €9 | 7 | | | | 5, 19, 25, 26 | |
| Polygonia c-album (L. 1758) | - | <u>+</u> | - | | | | | | | 7 | |
| Melitaea phoebe (Denis et Schiffermüller 1775) | | | | _ | ~ | _ | - | 50 | _ | 10, 37 | |
| Argynnis aglaja (L. 1758) | | | | 7 | 13, 19 | - | | | | 25, 26 | |
| Argynnis niobe (L. 1758) | | | | - | ~ | - | | | | 21 | |
| Boloria dia (L. 1767) | | | | | | | - | 13 | _ | 40 | |
| Family SATYRIDAE | | | | | | | | | | | |
| Brintesia circe (F. 1775) | 1 | 10% | - | 5 | <i></i> %6 | 3 | 7 | 13, 19 | - | 8, 21, 22, 23 | |
| Pararge aegeria (L. 1758) | 1 | 10% | | | | | | | | 4 | |
| Maniola jurtina (L. 1758) | | | | - | 100 | - | | | | 25 | |
| Hyponephele lupinus (O. Costa 1836) | | | | 2 | 2♂, 3♀ | _ | | 2⊰ | | 10, 11, 14,16 | |
| Coenonympha dorus (Esper 1782) | | | | 1 | r √ | - | 5 | 5 3, 2 \updownarrow | 7 | 30, 32, 33, 36 | |
| Hipparchia alcyone (Denis et Schiffermüller 1775) | | | | | | | | 3♂ | | 37, 38 | |
| | | | | | | | | | | | (Continued) |

(Table 2 Continued)

| (Iable 2 Communal) | | 3 | , | | | | | | | |
|---|-----|---------------|----------|----------|-----------------|-----|-----|--|-----|--|
| | 000 | Survey IND | I MAX | 2000 | Survey 2 IND | MAX | 000 | Survey 3 IND | MAX | Localities |
| Hipparchia semele (L. 1758) | | | | 1 | 13 | 1 | 2 | 2♂ | 1 | 19, 34, 38 |
| Neohipparchia statilinus (Hufnagel 1766) | | | | - | 10 | - | 4 | 123, 19 | 4 | 10, 33, 34, 39 |
| Pseudotergumia fidia (L. 1767) | | | | 2 | - ₹9 | 2 | 5 | 83,79 | 4 | |
| Family HESPERIDAE | | | | | | | | | | |
| Spialia sertorius (Hoffmannsegg 1804) | | | | | | | 4 | 3♂, 1♀ | - | 32, 35, 40 |
| HEMIPTERA - HETEROPTERA | | | | | | | | | | |
| FAM. ALYDIDAE | c | 6 | 5 | t | | - | - | <u>-</u> | - | 0, 00, 00, 00, 00, 00, 00, 00, 00, 00, |
| Atydus calcaratus (L. 1/58) | × | | 71 | | .071 | 4 | - | <u>.</u> 0 | _ | 1, 6, /, 9, 20, 25, 26, 2/, 28, 40 |
| Camptopus lateralis (Germar 1817) | 7 | 4€ | 2 | 31 | 52♂, 5♀ | 9 | 11 | 253 | 2 | 6, 9, 10, 11, 12, 13, 16, 18, 20, 21, 22, 23, 23, 26, 28, 31, 32, 33, 34, 37, 38, 39, 40 |
| Family COREIDAE | | | | | | | | | | |
| Bothrostethus annulipes (Herrich-Schaeffer 1835) | | | | 7 | 40⊰ | 25 | | | | 12, 26 |
| Centrocoris variegatus Kolenati 1845 | | | | 2 | 2⇔ | - | | | | 18, 20 |
| Ceraleptus gracilicornis (Herrich-Schaeffer 1835) | | | | 4 | % | 5 | | | | 16, 22, 25, 27 |
| Ceraleptus lividus Stein 1858 | | | | 9 | 10♂,1♀ | 5 | | | | 16, 25, 26, 27 |
| Ceraleptus obtusus (Brullé 1839) | - | 13 | - | α | 73 | 4 | | | | 9, 16, 26, 27 |
| Coriomeris affinis (Herrich-Schäffer 1839) | 4 | 4 | П | 24 | 35♂ | 4 | 10 | 36♂ | 16 | 8, 9, 10, 11, 12, 13, 15, 16, 18, 20, 21, 23, 24, 25, 27, 31, 33 |
| Coriomeris denticulatus (Scopoli 1763) | | | | 7 | 5♂ | 4 | 7 | 2♂, 2♀ | 7 | 25, 27 |
| Loxocnemis dentator (F. 1794) | | | | 7 | €06 | 7 | 4 | 53 | 7 | 10, 12, 13, 15, 31, 32, 34 |
| Syromastus rhombeus (L. 1767) | | | | - | 23€ | 2 | |) | | |
| FAM. LYGAEIDAE | | | | | | | | | | |
| Beosus maritimus (Scopoli 1763) | | | | 2 | 4♂,6♀ | ∞ | | | | 11 |
| Emblethis verbasci (F. 1803) | | | | 4 | 4⊰ | 1 | | | | 25, 26, 28 |
| Eremocoris abietis (L. 1758) | 3 | 1♂,4♀ | 7 | | | | | | | 2 |
| Eremocoris fenestratus (Herrich-Schaeffer 1839) | | | | | | | - | 0+ | _ | 38 |
| Gonianotus galactodermus Fieber 1861 | | | | 7 | 3♂ | 7 | 7 | 60 $\stackrel{?}{\sim}$, 1 $\stackrel{?}{\sim}$ | 21 | 10, 13, 31, 32, 33, 34 |
| Heterogaster artemisiae Schilling 1829 | | | | | | | n | 1♂,2♀ | _ | 31, 33 |
| Horvathiolus guttatus (Rambur 1839) | | | | | | | - | 10 | - | 33 |
| Macroplax fasciata (Herrich-Schaeffer 1835) | | | | | | | - | 10 | _ | 34 |
| Melanocoryphus albomaculatus (Goeze 1778) | | | | _ | 0+ | _ | _ | 50 | 7 | 22, 34 |
| Pezocoris apicimacula (A. Costa 1853) | | | | - | 2 | 7 | | | | 20 |
| Raglius confusus (Reuter 1886) | 7 | 13,19 | - | S | 63, 19 | 7 | | | | 6, 7, 20, 25, 27 |
| Raglius tristis (Fieber 1861) | | | | _ | 0+ | 1 | | | | 30 |
| Rhyparochromus phoeniceus (Rossi 1794) | | | | 7 | 20 | - | | | | 26 |
| Rhyparochromus vulgaris (Schilling 1829) | 7 | 5 † | | | | | | | | 7 |
| Trapezonotus dispar Stål 1872 | | | | | 10 | 1 | | | | 28 |
| Xanthochilus minusculus (Reuter 1885) | | | | | | | 1 | 10+ | - | 33 |
| | | | | | | | | | | (Continued) |
| | | | | | | | | | | |

(Table 2 Continued)

| | Survey OCC IND | _ | 1 S MAX OCC | 3 00C | Survey 2 IND | 2 MAX | Survey MAX OCC IND | Survey 3 IND | 3 MAX | Localities |
|---|-------------------|----------|----------------|----------|-----------------|----------|--------------------|------------------------|----------|------------|
| FAM. MIRIDAE | | | | | | | | | | |
| Capsodes flavomarginatus (Donovan 1798) | | | | 2 | 13,2 | 7 | | | | 28, 29 |
| Miridius longiceps Wagner 1955 | | | | | | | - | 10% | | 33 |
| Miridae sp. | | | | _ | II. | _ | | | | 27 |
| Phytocoris sp. | | | | - | 11 | | | | | 29 |
| Rhabdomiris striatellus (F. 1794) | 1 | 13 | 1 | | | | | | | 7 |
| Thiomiris sulphureus (Reuter 1879) | | | | - | 1% | | | | | 22 |
| Family NABIDAE | | | | | | | | | | |
| Himacerus apterus (F. 1798) | 3 1 | 13,22,11 | 7 | | | | | | | 5 |
| Himacerus mirmicoides (O. Costa 1834) | - | 13 | _ | | 0+ | | | | | 8, 23 |
| Family PENTATOMIDAE | | | | | | | | | | |
| Acrosternum heegeri Fieber 1861 | | | | - | 10+ | 1 | | | | 14 |
| Dolycoris baccarum (L. 1758) | | | | | | | - | 0+ | - | 34 |
| Dyroderes umbraculatus (F. 1775) | 1 | 13 | 1 | | | | | | | 8 |
| Eurydema ornata (L. 1758) | | | | - | 0+ | - | | | | 13 |
| Holcostethus strictus (F. 1803) | | | | _ | 13 | _ | | | | 21 |
| Picromerus nigridens (F. 1803) | | | | _ | 0+ | _ | | | | 23 |
| Piezodorus lituratus (F. 1794) | | | | _ | <u></u> | _ | | | | 14 |
| Sciocoris maculatus Fieber 1851 | | | | - | 1♂, 1♀, 1L | 3 | - | 10% | - | 12, 33 |
| FAM. REDUVIIDAE | | | | | | | | | | |
| Rhynocoris cuspidatus Ribaut 1921 | | | | _ | 0+ | _ | | | | 27 |
| FAM. RHOPALIDAE | | | | | | | | | | |
| Rhopalus conspersus (Fieber 1837) | | | | _ | 13,2 | 3 | | | | 26 |
| Rhopalus distinctus (Signoret 1859) | | | | | | | 4 | $7 \%, 2 \updownarrow$ | 9 | 31, 33 |

Table 3. Summary of the results obtained in the different samples. Also included is the proportion of sexes for each group of insects in each survey.

| | | Survey | y 1 | | | Surve | , y 2 | | | Surve | y 3 | |
|----------------|---------|-------------|------------------------------------|-------|---------|-------------|---------------|-------|---------------------|-------------|-------------|-------|
| | Apoidea | Lepidoptera | Heteroptera | Total | Apoidea | Lepidoptera | Heteroptera | Total | Apoidea | Lepidoptera | Heteroptera | Total |
| N. species | 7 | 12 | 11 | 30 | 6 | 35 | 33 | 77 | 10 | 12 | 16 | 38 |
| N. individuals | 510 | 103, 14 | 37% , 9 \updownarrow , $1L$ | 122 | 47 | 54♂, 72♀ | 202%, 33%, 3L | 411 | 14 <i>3</i> ′, 164♀ | 42♂, 12♀ | 139♂, 14♀ | 385 |
| Occurrences | 13 | 15 | 20 | 37 | 26 | 29 | 83 | 117 | 19 | 18 | 17 | 30 |
| Sex-ratio ♂/♀ | 0 | 0.72 | 4.11 | 1 | 0 | 0.75 | 6.12 | ; | 980.0 | 3.5 | 9.93 | ł |

carrion generally. The causes of attraction to carrion in bees remain unclear. Carrion has been considered as an important food source for social stingless bees in the Neotropical region (Silveira et al., 2005). Many species have been reported collecting meat or juices from carcasses. Some of them, such as T. hypogea and related species, are obligatorily necrophagous. In these stingless bees, pieces of meat are not transported to the nest but are masticated and consuming at the feeding site and are subsequently regurgitated to other workers in the nest to be used in larval nutrition (Noll et al., 1997; Serrão et al., 1997). In temperate regions, however, data on bees responses to or uses of carrion are very scarce. Nevertheless, it has been suggested that bees using carrion, faeces and urine as alternative sources of nitrogenous substances (Herrera, 1990). Bees use pollen as the usual source of nitrogen. So, this behaviour could be related to a shortage of flowers or low production of pollen. However, the catches of bees in our carrion traps were fairly evenly distributed between different sites and the different dates during the summer months. It is not very probable that floral resources were scarce simultaneously everywhere. From this point of view, we can consider that bees use the carrion, not as an alternative source, but as a regular and complementary source of proteins.

Lepidoptera

A total of 204 moths and butterflies were trapped, belonging to 49 species. The feeding behaviour of adult Lepidoptera is a somewhat neglected topic in the study of butterfly biology. In temperate regions butterflies most commonly obtain nutrients from floral nectar, and it is this behaviour which has received the most attention (Watt et al., 1974; Baz, 2002; Tudor et al., 2004). However, in the tropics, adult Lepidoptera (namely butterflies) are known to supplement their nectar diet by feeding on a much wider diversity of substrates, including decaying fruit and animal matter, and moist surfaces (a behaviour known as 'puddling') (Adler, 1982; Downes, 1973; Boggs and Jackson, 1991; Austin et al., 1993; Sculley and Boggs, 1996). However, Lepidoptera that feed on rotting carrion are less well known, although rotting carrion seems to be an important lepidopteran food source. Many authors have recorded adult Lepidoptera feeding on rotting carrion or attracted to carrion baits. For example, Austin and Riley (1995) recorded numerous species of butterflies on carrion baits and Hall and Willmott (2000) found more riodinid species attracted to rotting carrion than to any other substrate in Equatorian forests, and Hamer et al. (2006) found the same pattern in a tropical lowland rain forest in Sabah, Borneo. These taxa are butterflies of tropical latitudes, and examples of Lepidoptera in temperate regions feeding on rotting carrion are virtually unknown. The responses of 49 species to carrion that are summarized in this paper represent the most comprehensive data on the carrion habits of Lepidoptera in Europe. Most species that we collected belong to the moth family Noctuidae (32 species). The frequency and abundance of species in the genus Catocala that we trapped with carrion is remarkable. This is a genus that consists of large species with powerful flight. In addition to noctuid moths, all other species collected (with the exception of one species of Arctiidae) were butterflies belonging to the families Nymphalidae, Satyridae and Hesperidae. The causes of this behaviour are still controversial but, in light of recent work two hypotheses have been developed.

First, in most butterfly species, puddling is exclusively a male behaviour. A possible explanation for this division in feeding behaviour is that nutrients derived from puddling are transferred to the female in the spermatophore during mating as a nuptial gift (Smedley and Eisner, 1995; 1996). Secondly, in species in which both sexes puddle, nutrients might be used for neuromuscular activity in both males and females and may therefore correlate with flight morphology (Hall and Willmott, 2000).

While species that puddle are searching for minerals, we assume that species on carrion are searching for protein. Hall and Willmott (2000) found that those species attracted to rotting carrion seemed to have relatively large thoraces, while those species not recorded feeding from any substrate often had relatively small thoraces. Thus, it appears that there might be a general relationship between adult feeding behaviour and morphology in relation to flight and resultant metabolic rate. That is, Lepidoptera that are active and powerful flyers may have larger thoraces, and are active feeders as adults to support the high metabolic demands of flight. On the other hand, Beck et al. (1999) have experimentally investigated the attraction of adult butterflies to different bait types in two species-rich tropical communities on the island of Borneo and found that butterfly families differed consistently in their resource preferences. Representatives of the families Papilionidae and Pieridae more often visited NaCl solutions, but still accepted albumin, whereas representatives of the Nymphalidae, Hesperiidae and, in particular, Lycaenidae preferred the protein resource.

Our findings agree well with this mobility hypothesis. First, the sex-ratios of moths and butterflies that we captured indicate that both sexes of many species visit carrion (table 3). In some cases (i.e. the species of Catocala), this behaviour seem to be restricted to females. Second, almost all moths captured belong to the family Noctuidae, a family that consists of mobile and powerful flight species. With respect to butterflies we only found representative of the families Nymphalidae, Satyridae and Hesperiidae. No species of Papilionidae, Pieridae and Lycaenidae has been attracted to carrion-baited traps. Although in tropical latitudes, Lycaenidae preferred protein sources, in temperate zones they are more frequently observed at mud-puddles (see for instance Nieves-Aldrey, 2009). These results support the notion of a distinctive carrion-feeding fauna of Lepidoptera comprising more mobile species, which may use carrion to meet additional nitrogen requirements resulting from greater flight musculature and flight muscle use (Hamer, 2006) not only in tropical regions, where this behaviour is best studied, but also in temperate zones.

Heteroptera

We captured 438 individuals belonging to 46 species of bugs in the carrion traps Species such as *Camptopus lateralis* (Germar), *Alydus calcaratus* (L.), *Coriomeris affinis* (Herrich-Schaeffer) and *Gonianotus galactoder-*

mus Fieber are particularly frequents in the samples. True bugs are known to feed on non-plant sources such as bird droppings, dung and carrion (Adler and Wheeler, 1984). These authors reported eighteen species of Heteroptera, belonging mainly to the Coreidae and Alydidae, feeding on various extra-phytophagous foods. According to these authors, some of these bug species collected at carrion or excrement may have been preying on the other insects or may have been feeding on fungi. For example, Payne et al. (1968) observed the seedfeeding lygaeid Myodocha serripes Olivier preying on a dipteran larva in pig carrion. Several instances involved aggregations of individuals, especially at carrion. Numbers of bugs at carrion are not unheard of, with about 40 individuals of *Alydus eurinus* (Say) (Bromley, 1937) and 12 individuals of Merocoris distinctus Dallas (Engelhardt, 1912) seen at one carrion source. Such numbers suggest the possibility of long-distance orientation to carrion odour, although this has not been studied. Our results included some similar observations [i.e. Bothrostethus annulipes (Herrich-Schaeffer) 25 individuals in a sample; Coriomeris affinis (Herrich-Schaeffer) 16 and Gonianotus galactodermus Fieber 21]. Any gregarious behaviour at such food sources could be adaptative as a means of bringing together the sexes. Again, Payne et al. (1968) observed mating pairs of A. eurinus and Megalotomus quinquespinosus (Say) on pig carrion. The presence of mating pairs at extraphytophagous food sources raises the question of the sex of individuals involved in feeding. Unfortunately, the information available is scanty. The results of our surveys indicate that most bugs visiting or arriving at carrion (and trapped) were males (see table 1). This strongly skewed sex ratio suggests that females of the species that we trapped generally are not feeding at carrion, if they are not arriving at carrion. Considering all the catches of Heteroptera as a whole, the overall sex ratio in the three surveys is 4.11, 6.12 and 9.93 respectively (table 3). It seems clear therefore that in the case of the Heteroptera, the use of carrion as an alternative source of food has a strong sexual component. This may be related with the cost of mating for males. There may be a number of costs of mating for males, the most universal being the time and energy devoted to matefinding and courtship and the energetic costs of gamete production (Daly, 1978; Dewsbury, 1982). It is difficult to generalize when it comes to 46 species, but there is some evidence suggesting that mating may involve high costs for males of some species. By instance, Krupke et al. (2008) found that in the pentatomid bug Euschistus conspersus Uhler, males transfer a significant percentage of their body mass during the initial mating. Mating was also found to reduce male longevity by 37.8% but had no significant effect on female longevity or fecundity. From this point of view, we can speculate on the possibility that carrion feeding in males of some species may serve to supplant or add to proteins used that are part of the cost of mating. Obviously, it would be necessary to test this hypothesis experimentally, but in any case, our data have the interest of revealing a little known aspect of the biology of the Heteroptera.

Concluding remarks

Perhaps the most interesting aspect of our findings is how carrion appears to be a significant resource by many species of insects with strictly phytophagous diets, and potentially an additional source of protein that can be used in different aspects of their biology. Carrion-visiting was observed in all types of habitats, suggesting that it is an activity common in temperate latitudes. The ways in which this resource is exploited probably depends on the group of insects considered. Thus, in the case of the Apoidea, this activity was mainly by the workers of the colony. In the Lepidoptera, carrion appears to be used by both males and females, but maybe only by species with a large capacity for flight. In the case of the Heteroptera, this behaviour appears primarily in males and may have a strong sexual or reproductive component. Lastly, regardless of the reasons why phytophagous insects feed on carrion, it certainly constitutes an important resource for adults of many species in temperate latitudes, not only in the tropics, from where most of the information on the use of carrion as food for phytophagous insects originated.

Acknowledgements

This work has been funded by the Spanish Ministerio de Ciencia y Tecnologia (Research Project BOS2003-00400) and by the University of Alcala (Research Project PI2003/016). We also thank to Dr Francisco Sanchez-Aguado, director of the Natural park "Hoces del río Riaza", for the facilities provided during the fieldwork.

References

ADLER P. H., 1982.- Soil-and puddle-visiting habits of moths. *Journal of the Lepidopterists Society*, 36: 161-173.

ADLER P. H., WHEELER A. G., 1984.- Extra-phytophagous food sources of Hemiptera Heteroptera: Bird droppings, dung, and carrion.- *Journal of the Kansas Entomological Society*, 57 (1): 21-27.

ARNALDOS M. I., ROMERA E., PRESA J. J., LUNA A., GARCÍA M. D., 2004.- Studies on seasonal arthropod succession on carrion in the southeastern Iberian Peninsula.- *International Journal of Legal Medicine*, 118: 197-205.

AUSTIN G. T., RILEY T. J., 1995.- Portable bait traps for the study of butterflies.- *Tropical Lepidoptera*, 6 (1): 5-9.

AUSTIN G. T., BROCK J. P., MIELKE O. H. H., 1993.- Ants, birds, and skippers.- *Tropical Lepidoptera*, 4 (Suppl. 2): 1-11.

BAZ A., 2002.- Nectar plant sources for the threatened Apollo butterfly (*Parnassius apollo* L. 1758) in populations of central Spain.- *Biological Conservation*, 103 (3): 277-282.

BAZ A., CIFRIÁN B., DÍAZ-ARANDA L. M., MARTÍN-VEGA D., 2007.- The distribution of adult blow-flies (Diptera: Calliphoridae) along an altitudinal gradient in Central Spain.- Annales de la Societe Entomologique de France, 43 (3): 289-296.

BECK J., MUHLENBERG E., FIEDLER K., 1999.- Mud-puddling behavior in tropical butterflies: in search of proteins or minerals?- *Oecologia*, 119 (1): 140-148.

- Boggs C. L., Jackson L. A., 1991.- Mud puddling by butterflies is not a simple matter.- *Ecological Entomology*, 16 (1): 123-127.
- BRAACK L., 1987.- Community dynamics of carrion-attendant arthropods in tropical African woodland.- *Oecologia*, 72: 402-409
- Bromley S. W., 1937.- Alydus on carrion.- Bulletin of the Brooklyn Entomological Society, 32: 213.
- CASTILLO-MIRALBES M., 2002.- Estudio de la entomofauna asociada a cadáveres en el Alto Aragón (España).- Monografías S.E.A., 6. Sociedad Entomológica Aragonesa, Zaragoza, Spain.
- DALY M., 1978.- The cost of mating.- *The American Naturalist*, 112: 771-774.
- Dewsbury D. A., 1982.- Ejaculate cost and male choice.- *The American Naturalist*, 119: 601-610.
- DOWNES J. A., 1973.- Lepidoptera feeding at puddle-margins, dung and carrion.- *Journal of the Lepidopterists Society*, 27: 89-99
- ENGELHARDT G. P., 1912.- A hemipteron on carrion.- *Journal* of the New York Entomological Society, 20: 294.
- HALL J. P. W., WILLMOTT K. R., 2000.- Patterns of feeding behaviour in adult male riodinid butterflies and their relationship to morphology and ecology.- *Biological Journal of* the Linnaean Society, 69: 1-23.
- HAMER K. C., HILL J. K., BENEDICK S., MUSTAFFA N., CHEY V. K., MARYATI M., 2006.- Diversity and ecology of carrionand fruit-feeding butterflies in Bornean rain forest.- *Journal of Tropical Ecology*, 22 (1): 25-33.
- HERRERA C. M., 1990.- Bumble bees feeding on non-plant sources.- *Bee World*, 71: 67-69.
- KRUPKE C. H., BRUNNER J. F., JONES V. P., 2008.- Factors Influencing Mate Choice in *Euschistus conspersus* Uhler (Heteroptera: Pentatomidae).- *Environmental Entomology*, 37 (1): 192-197.
- LECLERCQ M., 1978.- Entomologie et Médecine Légale. Datation de la mort.- Ed. Masson, París, France.
- MARTÍNEZ-SÁNCHEZ A. I., ROJO S., ROGNES K., MARCOS-GARCÍA M. A., 1998.- Califóridos con interés faunístico en agroecosistemas de dehesa y catálogo de las especies ibéricas de Polleniinae (Diptera: Calliphoridae).- Boletín de la Asociación española de Entomología, 22 (1-2): 171-183.
- MOLLEMAN F., GRUNSVEN R. H. A., LIEFTING M., ZWAAN B. J., BRAKEFIELD P. M., 2005.- Is male puddling behaviour of tropical butterflies targeted at sodium for nuptial gifts or activity?- *Biological Journal of the Linnean Society*, 86: 345-361
- MORÓN M. A., TERRÓN R. A., 1984.- Distribucion altitudinal y estacional de los insectos necrofilos en la Sierra Norte de Hidalgo, Mexico.- *Acta Zoologica Mexicana*, 3: 1-47.
- Newton A., Peck S. B., 1975.- Baited pitfall traps for beetles.-The Coleopterists Bulletin, 29 (1): 45-46.

- Nieves-Aldrey J. L., 2009.- Bebederos de mariposas.- *Quercus*, 276: 52-55.
- NINYEROLA M., PONS X., ROURE J. M., 2005.- Atlas Climatico Digital de la Peninsula Iberica. Metodologia y aplicaciones en bioclimatologia y geobotanica.- Universidad Autonoma de Barcelona, Bellaterra, Spain.
- NOLL F. B., ZUCCHI R., JORGE J. A., MATEUS S., 1997.- Food collection and maturation in the necrophagous stingless bee, *Trigona hypogea* (Hymenoptera: Meliponinae).- *Journal of the Kansas Entomological Society*, 69: 287-293.
- PAYNE J. A., 1965.- A summer carrion study of the baby pig *Sus scrofa* Linnaeus.- *Ecology*, 46 (5): 592-602.
- Payne J. A., Mead F. W., King E. W., 1968.- Hemiptera associated with pig carrion.- *Annals of the Entomological Society of America*, 61: 565-567.
- ROUBIK D. W., 1982.- Obligate necrophagy in a social bee.-Science, 217: 1059-1060.
- Sculley C. E., Boggs C. L., 1996.- Mating systems and sexual division of foraging effort affect puddling behaviour by butterflies.- *Ecological Entomology*, 21 (2): 193-197.
- SERRÃO J. E., CRUZ-LANDIM C., SILVA-DE-MORAES R. L. M., 1997.- Morphological and biochemical analysis of the stored and larval food of an obligate necrophagous bee, *Trigona hypogea.- Insectes Sociaux*, 44: 337-344.
- SILVEIRA O. T., ESPOSITO M. C., SANTOS JR. J. N., GEMAQUE JR. F. E., 2005.- Social wasps and bees captured in carrion traps in a rainforest in Brazil.- *Entomological Science*, 8: 33-39
- SMEDLEY S. R., EISNER T., 1995.- Sodium uptake by puddling in a moth.- *Science*, 270 (5243): 1816-1818.
- SMEDLEY SR., EISNER T., 1996.- Sodium: A male moth's gift to its offspring.- *Proceedings of the National Academy of Sciences of the United States of America*, 93 (2): 809-813.
- TUDOR O., DENNIS R. L. H., GREATOREX-DAVIES J. N., SPARKS T. H., 2004.- Flower preferences of woodland butterflies in the UK: nectaring specialists are species of conservation concern.- *Biological Conservation*, 119. 397-403.
- WATT W. B., HOCH P. C., MILLS S. G., 1974.- Nectar resource use by Colias butterflies chemical and visual aspects.-*Oecologia*, 14: 353-374.
- **Authors' addresses:** Arturo Baz (corresponding author, arturo.baz@uah.es), Blanca CIFRIÁN, Daniel Martín-Vega, Departamento de Zoología y Antropología Física, Universidad de Alcalá, 28871 Alcalá de Henares, Madrid, Spain; Manuel Baena, Departamento de Biología y Geología; I.E.S. Trassierra; c/Avenida Arroyo del Moro s/n; 14011 Córdoba, Spain.

Received June 8, 2009. Accepted October 7, 2009.