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## Distribution and Current Status of HesperIIDae and PierIDae Species (Lepidoptera) Occurring in Bursa Province, Northwestern Turkey

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**Abstract:** This study was carried out in Bursa Province, Turkey, between 1995 and 2006 in order to collect data on hesperiid and pierid species, their distribution, and current status. The butterflies were caught with sweep nets from 78 localities in 16 towns in Bursa Province, northwestern Turkey. Materials were pinned with their wings spread and put into a collection after drying. In all, 822 hesperiid and 956 pierid specimens were caught, including 17 and 16 species, respectively. The hesperiid *Pyrgus serratulae* (Rambur, 1839) and pierid *Pieris manii* (Mayer, 1851) are first records for the butterfly fauna of Bursa. The horizontal and vertical distribution, and current status of the hesperiid and pierid species were determined and are herein discussed in detail.

**Key Words:** HesperIIDae, PierIDae, distribution, current status, Bursa, Turkey

### Bursa İlinde Bulunan HesperIIDae ve PierIDae Türlerinin (Lepidoptera) Yayılışı ve Bugünkü Statüleri

**Özet:** Bu çalışma 1995-2006 yılları arasında Bursa'daki hesperiid ve pierid türlerinin dağılımı ve bugünkü statülerinin belirlenmesi amacıyla yapılmıştır. Kelebekler tül atrap ile Bursa'nın 16 ilçesine ait 78 lokaliteden toplanmıştır. Örnekler laboratuvarında iğnelenerek kanatları gerilmiş ve kurutulduktan sonra koleksiyona alınmıştır. Sonuç olarak, Bursa ilinde HesperIIDae ve PierIDae familyalarına ait sırasıyla 822 ve 956 ergin yakalanmış ve yine sırasıyla 17 ve 16 tür belirlenmiştir. *Pyrgus serratulae* (Rambur, 1839) (HesperIIDae) ve *Pieris manii* (Mayer, 1851) (PierIDae), Bursa İli için ilk kayıttır. Toplanan türlerin Bursa İli'ndeki yatay ve dikey dağılımları ve statüleri belirlenmiş ve literatür verileriyle karşılaştırılarak tartışılmıştır.

**Anahtar Sözcükler:** HesperIIDae, PierIDae, yayılışı, bugünkü statüleri, Bursa, Türkiye

### Introduction

Recording, which is often equated with conducting surveys, and monitoring are the 2 main methods of studying butterfly fauna, according to Harding et al. (1995). These activities are further divided into 3 classes: survey, surveillance, and monitoring (Hellawell, 1991). A survey is a qualitative and/or quantitative observation, usually according to a standard procedure and conducted within a limited time period. On the other hand, surveillance is repeated surveyance for providing a time series in order to ascertain variability, but without

preconceptions of what the results should be. Monitoring is intermittent surveillance to measure either the extent or lack of variation from an established or expected norm.

Surveys on the fauna of Rhopalocera (Lepidoptera) in Turkey were initiated in the middle of the 19th century by European entomologists (Zeller, 1847; Mann, 1862; Oberthür, 1872; Staudinger, 1878) and continued in the 20th century (Fountaine, 1904; Graves, 1911, 1912; Wagner, 1929; De Lattin, 1950). These early studies on the Turkish Rhopalocera were later followed by expeditions by both Turkish and foreign entomologists

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(Kansu, 1961, 1963; Öktem, 1962, Higgins, 1966; Şengün and Güneyi, 1968; Güneyi, 1970; Güneyi and Kırmızı, 1971, Güneyi and Şengün, 1972; Güneyi and Uyar, 1972; Eisner and Wagener, 1974; Koçak, 1975, 1976, 1989a, 1989b; Betti 1989; Carbonell and Brevignon, 1983; Carbonell, 1992; Hesselbarth et al., 1995; Avcı and Özbek, 1996a, 1996b; Kornoşor et al., 1996; Kovancı et al., 1996).

The number of identified hesperiid species in Turkey increased from 40 (Hesselbarth et al., 1995; Baytaş, 2007) to 43 in recent years (Koçak and Kemal, 2006). *Carcharodus*, *Muschampia*, *Pyrgus*, and *Thymelicus* species are among the richest species of the hesperiid genera in Turkey (Baytaş, 2007). There was also a small increase in the number of pierid species, totaling 37, with the addition of 2 more species in the last decade (Koçak and Kemal, 2006). These species are members of the genera *Anthocharis*, *Aporia*, *Belenois*, *Catopsilia*, *Colias*, *Colotis*, *Euchloe*, *Gonepteryx*, *Leptidae*, *Pieris*, *Pontia*, and *Zegris*. Of these, *Pieris bowdeni* Eitschberger is endemic to Turkey (Baytaş, 2007).

In total, 20 species from both the hesperiid and pierid families have been recorded from Bursa Province; however, some of these species were collected only by Mann (1864) more than 100 years ago. The objective of

the present survey was to gather data on the distribution of the hesperiid and pierid faunas of Bursa, to assess the status (widespread or rare) of the butterflies recorded, and to identify sites of importance for butterfly conservation.

### Materials and Methods

In the present study hesperiid and pierid species were collected from 78 localities in 16 towns in Bursa Province, northwestern Turkey between 1995 and 2005. Butterflies caught with a sweep net were killed in potassium cyanide or ethyl acetate and were then transferred to the laboratory in a fatty envelope. All the butterfly specimens were pinned with wings spread, dried, and put into collection boxes. These species were identified by Prof. Dr. Bahattin Kovancı, according to Higgins (1982), Higgins et al. (1991), and Hesselbarth et al. (1995). The specimens were stored in the Uludağ University Agricultural Faculty collection.

Localities were selected from natural ecosystems representing the southern and northern slopes of Mount Uludağ. Specific information on the localities is provided. In addition, the location of towns and number of localities are shown in the Figure. Species status was determined

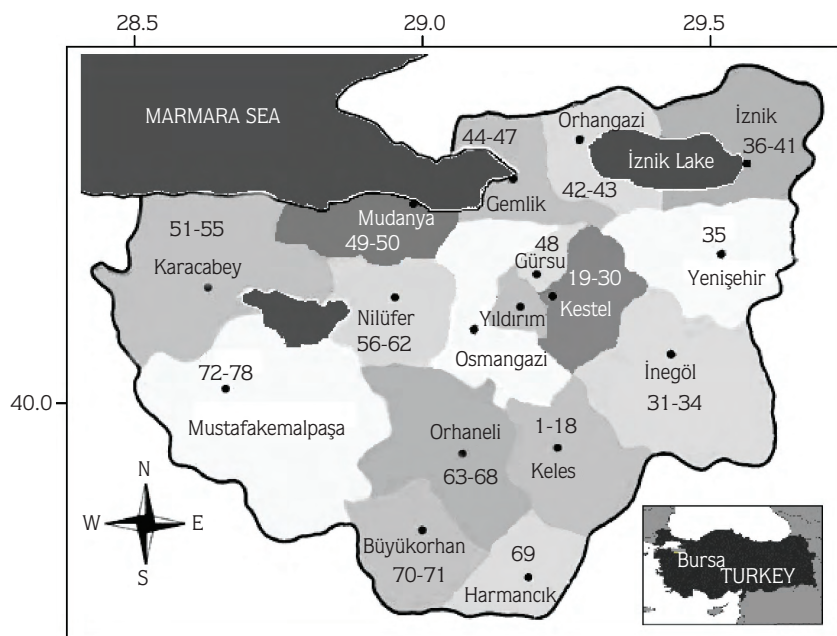


Figure. Map of Bursa, northwestern Turkey, indicating the number of localities where the pierid and hesperiid species were collected.

according to distribution in Bursa Province and presence in the localities. Species that were found in more than 20% of the examined localities were considered widespread. The localities were as follows:

**Keles**, 1: Kocayayla, 1215 m; 2: Epçeler, 1 km E, 1280 m; **Osmangazi**, 3: Karaislah, 1 km N, 925 m 4: Karaislah, 2 km W, 700 m; 5: Çaybaşı, 3 km E, 650 m; 6: Bağlı, 1 km NE, 1100 m; 7: Soğukpınar, 1 km NW, 1045 m; 8: Soğukpınar-Gölcük, 1200 m; 9: Soğukpınar-Ketenlik Plateau, 1430 m; 10: Uludağ-Aras Valley, 2000 m; 11:

Uludağ-Kuşaklıkaya, 2200 m; 12: Uludağ Hotel region, 1900 m; 13: Uludağ-Kirazlıyayla, 1500 m; 14: Kirazlı, 4 km NE, 1300 m; 15: Kirazlı, 875 m; 16: Hüseyinalan, 1005; 17: Yiğitalı, 1 km E, 750 m; 18: Gündoğdu, 245 m; **Kestel**, 19: Derekızık, 2 km N, 300 m; 20: Derekızık, 2 km S, 515 m; 21: Saitabat, 640 m; 22: Osmaniye, 500 m NW, 600 m; 23: Burhaniye, 3 km NW, 250 m; 24: Gözede, 3 km NE, 400 m; 25: Gözede, 2 km E, 560 m; 26: Alaçam, 1 km N, 775 m; 27: Alaçam, 100 m S, 1030 m; 28: Şevketiye, 2 km N, 570 m; 29: Şevketiye, 1 km S, 800 m; 30: Sayfiye, 1 km W, 830 m; **İnegöl**, 31: Çiftlikköy, 200 m SW, 875 m; 32: Küçükyenice, 300 m; 33: Edebey, 1 km W, 360 m; 34: Deydinler, 1 km W, 340 m; **Yenişehir**, 35: Mecidiye, 3 km W, m; **İznik**, 36: Sansarak Upper Canyon, 725 m; 37: Hisardere, 2 km SE, 625 m; 38: Ömerli, 220 m; 39: Çamdibi, 100 m; 40: İznik vicinity, 85 m; 41: Gölyaka, 95 m; **Orhangazi**, 42: Orhangazi, 10 km E, 95 m; 43: Hamzalı, 2 km E, 355 m; **Gemlik**, 44: Narlı, 4 km W, 20 m; 45: Karacaali, 300 m N, 290 m; 46: Kurşunlu, 15 m; 47: Hamidiye, 2 km W, 460 m; **Gürsu**, 48: Ericek, 1 km E, 715 m; **Mudanya**, 49: Altıntaş, 500 m SW, 85 m; 50: Kumyaka, 20 m; **Karacabey**, 51: Malkara, 20 m; 52: Çarık, 1 km SW, 15 m; 53: Seyran, 40 m; 54: Hürriyet, 45 m; 55: Eskikaraağaç, 15 m; **Nilüfer**, 56: Gölyazı, 20 m; 57: Hasanağa 3.5 km SW, 300 m; 58: Hasanağa, 6 km SW 375 m; 59: Uludağ University, Görükle Campus, 80 m; 60: Kayapa Inlet vicinity, 180 m; 61: Kuruçeşme, 3 km NW, 385 m; 62: Maksempınar, 2 km NE, 390 m; **Orhaneli**, 63: Göynükbelen, 2 km SW, 750 m; 64: Göktepe, 4 km NE, 620 m; 65: Göktepe, 2 km NW, 725 m; 66: Erenler, 6 km N, 435 m; 67: Sadağı Canyon, 450 m; 68: Küçükorhan, 2 km S, 945 m; **Harmancık**, 69: Harmancık 11 km NW, 1010 m; **Büyükorhan**, 70: Büyükorhan vicinity, 800 m; 71: Büyükorhan Dam vicinity, 700 m; **Mustafakemalpaşa**, 72: Körekem, 2 km

E, 470 m; 73: Körekem, 1 km W, 480 m; 74: Körekem, 3 km W, 470 m; 75: Kadirçeşme, 600 m SE, 300 m; 76: Kayabaşı, 1 km SW, 160 m; 77: Muradiyesarnıcı, 265 m; 78 Muradiyesarnıcı-Suuçtu Falls vicinity, 405 m.

## Results

Table 1 lists the total number of pierid and hesperiid species, as well as their distribution, sex ratio, and status between 1995 and 2005 in Bursa. Many species were collected between April and September, while some species, such as *Pieris napi*, were collected between March and October (Table 1). Most pierid and hesperiid species had a wide altitudinal distribution, from 15 to 2200 m (Table 2). For rare species, detailed information on the distribution of localities, dates of first and last capture, and number of male and females caught is given. Locality numbers are noted in parentheses.

### Family: Hesperidae

#### *Carcharodus alceae* (Esper, 1780)

This species was widely distributed and collected from 20 of the 78 localities visited in Bursa. The first adult was caught on 6 April at locality 59 and the last on 13 October at locality 40. In all, 96 adults, composed of 20 females and 76 males, were caught.

#### *Carcharodus orientalis* Reverdin, 1913

**Material**, 1997: 2.08, 1 ♂, (6); 2001: 27.04, 3 ♂♂ (59); 17.05, 1 ♀ (59); 22.05, 1 ♂ (59); 12.06, 1 ♂ (46); 18.06, 2 ♂♂ (59), 28.06, 1 ♂ (59); 19.07, 1 ♂ (10); 20.07, 1 ♂ (59); 8.08, 1 ♂, 1 ♀ (11); 17.08, 1 ♂ (59); 2002: 20. 09, 1 ♂ (38); 2003: 29.05, 2 ♂♂ (59); 4.06, 1 ♂ (56); 6.06, 3 ♂♂ (59); 11.06, 1 ♂ (59); 23.06, 1 ♀ (59) 13.08, 1 ♂ (11); 28.08, 2 ♂ (59); 2004: 13.08, 1 ♀(10) 2006: 30.05, 4 ♂♂ (67); 7.06, 4 ♂♂, 1 ♀ (76); 16.06, 1 ♂ (72); 24.06, 1 ♂ (68); 5.07, 1 ♂ (76).

#### *Erynnis tages* (Linnaeus, 1758)

This species was widespread and was collected from 21 localities. First adult emergence was observed on 28 April at localities 16 and 58, and the last adult was recorded on 6 September at locality 21. In total, 64 adults, composed of 18 females and 46 males, were caught.

#### *Gegenes nostradamus* (Fabricius, 1793)

**Material**, 2001: 19.09, 1 ♂ (56); 2002: 20.09, 1 ♂ (38).

*Hesperia comma* (Linnaeus, 1758)

*H. c. pallida* Stowdinger, 1901

Material, 2001: 11.08, 1 ♀ (3); 2003: 16.08, 1 ♀ (3), 1 ♂, 2 ♀ (9); 21.08, 1 ♀ (3); 6 ♂, 4 ♀ (9); 30.08 1 ♀ (3), 1 ♂, 3 ♀ (9).

*Muschampia tessellum* (Hübner, 1803)

*M.t. tessellum* (Hübner,

Material, 2006: 22.05, 1 ♀ (48); 6.06, 1 ♂, 1 ♀ (62); 29.06, 2 ♂ (62).

*Ochlodes sylvanus* (Esper, 1777)

This species was widespread in Bursa and was collected from 22 localities. The first adults were caught on 22 May at locality 59 and the last adults were caught on 21 August at localities 3, 9, and 16. During the study period, sweep net captures of this species reached a total of 73 adults, consisting of 15 females and 58 males.

*Pyrgus armoricanus* (Oberthür, 1910)

*P.a. persicus* (Reverdin, 1913)

Material, 1998: 10.06, 1 ♂ (1); 2001: 19.06, 1 ♂ (3); 2003: 8.05, 1 ♂ (59); 29.05, 1 ♂ (59); 1.06, 1 ♀ (19); 11.06, 3 ♂ (59); 26.07, 2 ♀ (24); 29.08, 2 ♂ (20); 2005: 4.05, 1 ♂ (59); 24.05, 2 ♂ (37); 2006: 3.06, 1 ♂ (7).

*Pyrgus malvae* (Linnaeus, 1758)

This species was the second most widespread species and was caught at 27 localities in Bursa. Adults were first and last observed on 15 April and 6 September at localities 6 and 21, respectively. Of the 87 collected specimens, 15 were female and 72 were male.

*Pyrgus serratulae* (Rambur, 1839)

*P.s. major* (Staudinger, 1878)

Material, 30.05.2006, 1 ♂ (64).

*Pyrgus sidae* (Esper, 1784)

Material, 2003: 29.05, 3 ♂ (59); 2004: 2.06, 1 ♂ (64); 10.06, 1 ♂, 1 ♀ (64); 2006: 30.05, 4 ♂ (67); 6.06, 1 ♂ (62); 16.06, 1 ♂ (72); 20.06, 1 ♂ (4).

*Spialia orbifer* (Hübner, 1825)

This species was not very widespread and was found at 16 localities. First and last adults were caught on 27 April and September at localities 59 and 7, respectively. In total, 97 adults (20 female and 77 male) were collected.

*Spialia phlomidis* (Herrich-Schäffer, 1845)

Material, 2003: 2.08, 1 ♂ (3); 2004: 2.06, 2 ♂, (67); 2006: 30.05, 1 ♂ (67).

*Thymelicus acteon* (Rottemburg, 1775)

This species was one of the latest emerging species and occurred at 16 localities. The first adult was caught on 6 June at locality 57 and the last adult was caught on 19 July at locality 3. Of the 87 individuals caught, 36 were female and 51 were male.

*Thymelicus hyrax* (Lederer, 1861)

Material, 2003: 3.07, 1 ♂ (60); 2005: 8.07, 1 ♂ (60).

*Thymelicus lineola* (Oschenheimer, 1808)

Material, 1997: 28.06, 2 ♂ (6); 07.07, 1 ♂ (8); 2001: 8.06, 4 ♂ (59); 23.06, 1 ♂ (7), 3 ♂, 1 ♀ (8); 8.07, 2 ♂, 2 ♀ (8); 21.06, 4 ♂ (7), 1 ♂ (15); 2004: 9.07, 1 ♀ (67); 2005: 16.06, 1 ♂, 1 ♀ (74); 2006: 16.06, 1 ♂, 1 ♀ (72); 20.06, 2 ♂, 1 ♀ (4); 24.06, 1 ♂, 1 ♀ (60), 2 ♂, 1 ♀ (71); 29.06, 1 ♂ (62).

*Thymelicus sylvestris* (Poda, 1761)

*T. s. syriaca* (Tutt, 1905)

This was the most widespread hesperiid species in Bursa and was collected from 30 of the 78 localities. The first adult was caught on 18 April at locality 8, and adult flight ended on 2 August at locality 6. Overall, the number of adult catches during the study period totaled 180 (53 female, 127 male).

Family: Pieridae

*Anthocharis cardamines* (Linnaeus, 1758)

This species was widespread in 28 localities. Adult flight began on 2 March at locality 59 and continued until 14 June at locality 9. In total, 89 adults, composed of 18 females and 71 males, were caught.

*Aporia crataegi* (Linnaeus, 1758)

This species was widespread, especially in forested areas near the mountain zone. Adults were caught at 16 localities. Adults were first detected on 10 May and last on 8 July at localities 76 and 7, respectively. In total, 33 adults (8 female and 25 male) were caught.

*Colias alfacariensis* Ribbe, 1905

Material, 1995: 14.06, 1 ♀ (9); 25.07, 1 ♀ (8); 2.08, 1 ♀ (8); 7.08, 1 ♂, 1 ♀ (7); 1998: 11.08, 1 ♂, (2); 3.10,

1 ♂ (8); 1999: 22.06, 1 ♂ (30); 2000: 1.07, 1 ♀ (7); 2001: 30.06, 1 ♂ (22); 14.07, 1 ♀ (22); 23.08, 2 ♂ (22); 6.09, 1 ♂, 1 ♀ (21); 2002: 6.08, 1 ♂, (38); 2003: 5.07, 1 ♂ (7); 13.07, 1 ♂ (22); 1 ♂ (25); 1 ♂ (26); 29.08, 3 ♂ (20), 1 ♂ (22); 30.08, 1 ♂ (7); 23.9, 1 ♂ (20); 2005: 4.05, 1 ♀ (53).

*Colias croceus* (Fourcroy, 1785)

This was the most widespread pierid species in Bursa and occurred at 45 of the 78 localities. Adults were first seen on 6 April at locality 45, and the last adult catch was recorded on 11 October at locality 6. Of the 197 individuals caught, there were 118 females and 79 males.

*Euchloe ausonia* Hübner, 1804

*E. a. taurica* Röber, 1907

Material, 1998: 17.04. 4 ♂, 2 ♀(59); 2000: 17.04, 1 ♂, 1 ♀ (56); 1.06, 1 ♀ (6); 1 ♀(59); 2001: 20.03, 1 ♂ (59); 28.03, 4 ♂, 1 ♀ (59); 11.05, 3 ♂, 2 ♀ (56); 12.05, 1 ♂ (17); 17.05, 1 ♂ (59); 22.05, 1 ♀(59); 26.05, 1 ♂ (25); 2002: 7.05, 1 ♀ (18); 20.09, 1 ♀ (38); 2003: 7.05, 1 ♂ (59); 11.05, 1 ♀ (19); 13.05, 1 ♂ (59); 14.05, 1 ♂ (59); 20.09, 2 ♂ (38); 2004: 5.04, 2 ♂ (59); 9.04, 1 ♂, 1 ♀ (59), 20.04, 2 ♂ (59); 2005: 4.05, 1 ♂, 1 ♀ (53); 2006: 17.05, 1 ♂, 1 ♀(49).

*Gonepteryx farinosa* (Zeller, 1847)

*G. f. turcirana* De Freina, 1983

Material, 1997: 17.08, 2 ♂ (11); 2004: 9.07, 1 ♂ (75); 2005: 7.06, 1 ♂ (8).

*Genepteryx rhamni* (Linnaeus, 1758)

*G. r. rhamni* (Linnaeus, 1758)

Material, 1997: 5.06, 2 ♂, 1 ♀ (10); 12.07, 1 ♂ (10); 12.07, 1 ♂ (10), 19.07, 3 ♂, 1 ♀ (12); 1998: 3.10, 1 ♂(8); 1999: 10.04, 1 ♂ (6); 10.06, 1 ♂(24); 27.27, 2 ♂(12); 2001: 17.05, 1 ♂(15); 9.06, 1 ♂ (26); 2003: 7.06, 1 ♂(3); 13.08, 1 ♂ (11); 2004: 16.03, 1 ♂(60); 9.07, 6 ♂, 1 ♀ (67); 29.07, 1 ♂ (36); 2005: 9.04, 1 ♂ (3); 24.04, 1 ♀ (64); 2006: 22.04, 1 ♀ (66); 3.06, 1 ♂ (8).

*Leptidea duponcheli* (Stowdinger, 1871)

*Leptidea d. lorkovici* (Preiffer, 1932)

Material, 1997: 7.08, 1 ♀ (5); 1999: 7.04, 1 ♀ (26) 2005: 9.04, 1 ♀ (1).

*Leptidea sinapis* (Linnaeus, 1758)

This species was the second most widespread pierid species and was caught at 34 localities. The first adult was

caught on 6 April at locality 59 and last adult was collected on 31 August at locality 28. In all, 110 adults (25 female and 85 male) were caught.

*Pieris brassicae* (Linnaeus, 1758)

*P. b. brassicae* (Linnaeus, 1758)

This species was collected from 16 localities. It was found to be more widespread in agro-ecosystems than in natural ecosystems. Adult flight began on 2 March at locality 59 and ended on 29 September at locality 38. In total, 43 adults (23 female and 20 male) were caught.

*Pieris bryoniae* (Hübner, 1806)

*P. b. turcica* Eitschberger of Hesselbarth, 1977

Material, 1997: 25.06, 1 ♀ (10), 2 ♀ (12); 3.07, 1 ♀ (12); 12.07, 1 ♀ (10); 1998: 15.04, 1 ♂ (6); 18.04, 1 ♂ (6); 6.05, 2 ♂ (9); 2003: 19.06, 1 ♂, 1 ♀ (11).

*Pieris krueperi* Standinger, 1860

Material, 2003: 3.07, 1 ♂ (60); 4.07, 4 ♂, 5 ♀ (60); 10.07, 2 ♂ (60); 17.07, 4 ♂, 1 ♀ (60); 2004: 9.07, 6 ♀ (67), 2005: 24.04, 1 ♂ (67).

*Pieris manii* (Mayer, 1851)

*P. m. hethaea* (Pfeiffer, 1931)

Material, 2004: 20.08, 2 ♀ (69).

*Pieris napi* (Linnaeus, 1758)

*P. n. pseudorapae* Verity, 1908

This species was also widespread and was collected at 29 localities. The first adult catch occurred on 28 March at locality 58 and the last adult was caught on 13 October at locality 40. Overall, the number of adult catches during the study period totaled 123 (45 female, 78 male).

*Pieris rapae* (Linnaeus, 1758)

This widespread pierid species was present at 30 localities. The first adult was collected on 28 March at locality 59 and adult flight continued until the last catch on 13 October at locality 40. In total, 103 adults (29 female and 74 male) were caught.

*Pontia edusa* (Fabricius, 1777)

This species was widespread and was recorded at 32 localities. The first adult was caught on 6 April at locality 56 and the last adult was collected on 13 October at locality 40. Of the 113 individuals caught, there were 53 females and 60 males.

## Discussion

During the present study 17 hesperiid species, including 7 widespread and 10 rare, and 16 pierid species, 8 widespread and 8 rare, were caught in Bursa Province (Table 1). The most widespread hesperiid and pierid species were *T. sylvestris*, *P. malvae*, and *O. sylvanus*, and *C. croceus*, *L. sinapis*, and *P. edusa*, respectively. Although found only in a few localities, populations of *S. orbifer* and *T. acteon* were also high in number. All the hesperiid species caught were either bivoltine or trivoltine, except the widespread species *O. sylvanus* and *T. acteon* (Table 1, Hesselbarth et al., 1995). On the other hand, the pierid species were multivoltine, except *A. cardamines* and *A. crataegi* (Table 1, Hesselbarth et al. 1995). According to Bink (1992) and Hodgson (1993), widespread and common butterfly species are expected to have more larval food plants available, more generations per year, and greater mobility than rare and localized butterflies.

Many species were collected between April and September, while some species, such as *Pieris napi*, were found between March and October. *O. sylvanus* adults were caught during May-July, or July-August, at low and high altitudes, respectively. This could explain the prolonged flight period of this species (Table 1).

Larval food plants of the univoltine hesperiid species like *O. sylvanus* and *T. acteon* were commonly found in some of the study areas. These food plants included the Graminae species *Dactylis glomerata* and *Festuca arundinacea*, as well as the genera *Bromus* and *Brachypodium*. In addition, plant species such as *Cardamine bulbifera* and other Cruciferae (larval host plants of the widespread univoltine pierid species *A. cardamines*), and larval food plants of *A. crataegi*, such as *Crataegus monogyna* and *Prunus spinosa*, and genera *Malus*, *Pyrus*, and *Sorbus*, were widespread and abundant. Pollard and Eversham (1995) showed that the presence of a breeding population of a species at a site requires the presence of a food plant. Thus, the host plants of the common pierid and hesperiid butterflies were widely distributed in the region.

The wide range of altitudinal variation among Uludağ (2543 m), Kadirli (1283 m), and Samanlı (1600 m) mountains in Bursa Province possibly favored the presence of eurytopic butterfly species; however, most hesperiid and pierid species were found at altitudes <

1000 m. Nonetheless, some pierid species, *C. croceus*, *P. brassicae*, *P. napi*, and *P. edusa*, were distributed up to 2000 m or higher (Table 2). In addition, mobility may have affected the distribution of the butterflies.

According to Shreeve (1995), butterfly species can be classified by the types of habitat they occupy. The habitats occupied by hesperiid and pierid species were generally associated with the short-lived seral stage, but *E. tages*, *P. malvae*, and *P. napi* live in the early seral stage. On the other hand, 3 categories of mobility have been used for the butterflies of Britain by Pollard and Yates (1995). These categories are sedentary, wide-ranging, and intermediate. The hesperiid species *E. tages*, *O. sylvanus*, *T. lineola*, and *T. sylvestris* were sedentary, while the rare *H. comma* was intermediate in mobility. The Pieridae species *A. cardamines*, *L. sinapis*, and *P. napi* were active intermediately, whereas *C. croceus*, *G. rhamnii*, *P. brassicae*, and *P. rapae* were wide-ranging species.

The possibility of the extinction of the rare *P. bryoniae* in Bursa Province is high, as it is in many parts of the world. *P. b. turcica*, the subspecies of *P. bryoniae* found in Bursa Province, was distributed in only 10 towns in northern Anatolia. It was only collected from Mount Uludağ at an altitude of 2000 m. This rare species was caught at 5 different localities in the present study.

Only one or few specimens of the following rare hesperiid species were found: *G. nostrodamus*, *M. tessellum*, *P. sidae*, *S. phlomidis*, and *T. hyrax*. Rare pierid species were *G. farinosa* and *L. duponcheli*. In addition, populations of the hesperiid species *P. serratulae* and the pierid species *P. manni* are under the threat of extinction. *G. nostrodamus* and *M. tessellum* were last noted on 1851 and 1863 by J. Mann, and have not been recorded since (Mann, 1862, 1864). Similarly, *T. hyrax* was collected only in 1939 by Kosswing (Hesselbarth et al., 1995). The present study proves the existence of these rare species.

Apart from the hesperiid species mentioned above, Mann (1862) reported the presence of *Carcharodus lavaterae* (Esper, 1783) and *Erynnis marloyi* (Boisduval, 1834), as well as *Pyrgus cinarae* (Rambur, 1839) (Mann, 1864), in Bursa Province. Additionally, 1 male *Pyrgus carthami* (Hübner, 1813) was collected in Bursa by Evans in 1949 (Hesselbarth et al., 1995); however, we were unable to recover these species. None of the following pierid species, which were previously reported (Mann,

Table 1. Hesperiid and pierid species caught in Bursa Province between 1995 and 2006, as well as their status, flight periods, and number of collection localities.

FAMILY, SPECIES	Number of Species			Status		Flight Periods											
	♀	♂	Total	Locality No.	W or R	Months											
						1	2	3	4	5	6	7	8	9	10	11	12
<b>HESPERIIDAE</b>																	
<i>Carcharodus</i>																	
<i>alceae</i>	20	76	96	20	W	-	-	-	+	+	+	+	+	+	-	-	
<i>Carcharodus orientalis</i>	5	35	40	11	R	-	-	-	+	+	+	+	+	+	-	-	
<i>Erynnis tages</i>	18	46	64	21	W	-	-	-	+	+	+	+	+	+	-	-	
<i>Gegenes nostradamus</i>	-	2	2	2	R	-	-	-	-	-	-	-	-	+	-	-	
<i>Hesperia comma</i>	13	8	21	2	R	-	-	-	-	-	-	-	+	-	-	-	
<i>Muschampia tessellum</i>	2	3	5	2	R	-	-	-	+	-	-	-	-	-	-	-	
<i>Ochlodes sylvanus</i>	15	58	73	22	W	-	-	-	-	+	+	+	+	-	-	-	
<i>Pyrgus armoricanus</i>	3	13	16	9	R	-	-	-	-	+	+	+	+	-	-	-	
<i>Pyrgus malvae</i>	15	72	87	27	W	-	-	-	+	+	+	+	+	+	-	-	
<i>Pyrgus serratulae</i>	-	1	1	1	R	-	-	-	-	+	-	-	-	-	-	-	
<i>Pyrgus sidae</i>	1	12	13	6	R	-	-	-	-	+	+	-	-	-	-	-	
<i>Spialia orbifer</i>	20	77	97	16	W	-	-	-	+	+	+	+	+	+	-	-	
<i>Spialia phlomidis</i>	-	3	3	2	R	-	-	-	-	+	+	-	+	-	-	-	
<i>Thymelicus acteon</i>	36	51	87	16	W	-	-	-	-	-	+	+	-	-	-	-	
<i>Thymelicus hyrax</i>	-	2	2	1	R	-	-	-	-	-	-	+	-	-	-	-	
<i>Thymelicus lineola</i>	9	26	35	12	R	-	-	-	-	-	+	+	-	-	-	-	
<i>Thymelicus sylvestris</i>	53	127	180	30	W	-	-	-	+	+	+	+	+	-	-	-	
<b>PIERIDAE</b>																	
<i>Anthocharis cardamines</i>	18	71	89	28	W	-	-	+	+	+	-	-	-	-	-	-	
<i>Aporia crataegi</i>	8	25	33	16	W	-	-	-	-	+	+	+	-	-	-	-	
<i>Colias alfacariensis</i>	8	19	27	10	W	-	-	-	-	+	+	+	+	+	-	-	
<i>Colias croceus</i>	118	79	197	45	W	-	-	-	+	+	+	+	+	+	+	-	
<i>Euchloe ausonia</i>	16	28	44	10	R	-	-	+	+	+	+	-	-	+	-	-	
<i>Gonepteryx farinosa</i>	-	4	4	3	R	-	-	-	+	-	-	-	+	-	-	-	
<i>Gonepteryx rhamni</i>	5	25	30	14	R	-	-	+	+	+	+	+	+	-	+	-	
<i>Leptidea duponcheli</i>	3	-	3	3	R	-	-	-	+	-	-	-	+	-	-	-	
<i>Leptidea sinapis</i>	25	85	110	34	W	-	-	-	+	+	+	+	+	-	-	-	
<i>Pieris brassicae</i>	23	20	43	16	W	-	-	+	+	+	+	+	+	+	-	-	
<i>Pieris bryoniae</i>	6	5	11	5	R	-	-	-	+	+	+	+	-	-	-	-	
<i>Pieris krueperi</i>	6	5	11	5	R	-	-	-	+	-	-	+	-	-	-	-	
<i>Pieris manii*</i>	2	-	2	1	R	-	-	-	-	-	-	-	+	-	-	-	
<i>Pieris napi</i>	45	78	123	29	W	-	-	+	+	+	+	+	+	+	+	-	
<i>Pieris rapae</i>	29	74	103	30	W	-	-	-	+	+	+	+	+	+	+	-	
<i>Pontia edusa</i>	53	60	113	32	W	-	-	-	+	+	+	+	+	+	+	-	

\*First record for Bursa.



Table 2. Elevation of hesperiid and pierid species habitats in Bursa, Turkey.

HESPERIIDAE Species	Elevation of Habitats (m)	PIERIDAE Species	Elevation of Habitats (m)
<i>Carcharodus alceae</i>	15-1200	<i>Anthocharis cardamines</i>	15-1430
<i>Carcharolus orientalis</i>	15-2200	<i>Aporia crataegi</i>	180-1430
<i>Erynnis tages</i>	160-2000	<i>Colias alfacariensis</i>	40-1430
<i>Gegenes nostradamus</i>	20-220	<i>Colias croceus</i>	20-2200
<i>Hesperia comma</i>	925-1430	<i>Euchloe ausonia</i>	20-1100
<i>Maschampia tessellum</i>	390-715	<i>Gonepteryx farinosa</i>	450-2200
<i>Ochlodes sylvanus</i>	20-1430	<i>Gonepteryx rhamni</i>	180-2200
<i>Pyrgus armoricanus</i>	40-1500	<i>Leptidea duponcheli</i>	650-1215
<i>Pyrgus malvae</i>	80-1430	<i>Leptidea sinapis</i>	80-1430
<i>Pyrgus serratulae</i>	620	<i>Pieris brassicae</i>	15-2200
<i>Pyrgus sidae</i>	80-700	<i>Pieris bryoniae</i>	1100-2200
<i>Spialia orbifer</i>	80-1200	<i>Pieris krueperi</i>	180-450
<i>Spialia phlomidis</i>	450-925	<i>Pieris mannii</i>	1010
<i>Thymelicus acteon</i>	15-1430	<i>Pieris napi</i>	15-2000
<i>Thymelicus hyrax</i>	180	<i>Pieris rapae</i>	15-1430
<i>Thymelicus lineola</i>	80-1200	<i>Pontia edusa</i>	15-2200
<i>Thymelicus sylvestris</i>	20-1430		

1862; Kansu, 1961), were found: *Pieris ergane* (Geyer, 1828), *Pontia chloridice* (Hübner, 1813), and *Pontia callidice* (Herrich-Schäffer, 1844).

The numbers of hesperiid and pierid species at altitudes ranges of 0-500, 501-1000, 1001-1500, 1601-2000, and 2001 m were 15, 15, 11, 2, and 1, and 13, 13, 15, 7, and 6, respectively. Apparently, the number of hesperiid species was unchanged from 0 to 1000 m and declined after 1500 m. In contrast, the number of pierid species was high until 1500 m and declined thereafter. Evidently, both the presence of host plants and mobility affected their distribution. Pollard and Yates (1995) reported that the hesperiid species *O. sylvanus*, *T. lineola*, and *T. sylvestris* were sedentary, and that the pierid species *C. croceus*, *G. rhamni*, *P. brassicae*, and *P. rapae* have wide-ranging mobility in England.

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