Arch. Biol. Sci., Belgrade, 64 (1), 365-370, 2012 DOI:10.2298/ABS1201365A

FLEA BEETLES (COLEOPTERA: CHRYSOMELIDAE: ALTICINAE) COLLECTED BY MALAISE TRAP METHOD IN GÖLCÜK NATURAL PARK (ISPARTA, TURKEY), WITH A NEW RECORD FOR TURKISH FAUNA

E. GÜL ASLAN[1,*], G. JAPOSHVILI[2], B. ASLAN[3] and I. KARACA[4]

[1] *Department of Biology, Faculty of Arts and Sciences, Süleyman Demirel University,* 32260 Isparta, Turkey
[2] *Entomology and Biocontrol Research Centre, Ilia State University,* Tbilisi, Georgia
[3] *Department of Medical and Aromatic Plants, Tefenni Vocational School of Higher Education, Mehmet Akif Ersoy University,* 15600 Tefenni, Burdur, Turkey
[4] *Department of Plant Protection, Faculty of Agriculture, Suleyman Demirel University,* 32260 Isparta, Turkey

Abstract – This study is based on Alticinae (Coleoptera: Chrysomelidae) material collected by Malaise trapping which is different from other standardized collecting methods. A total of 19 flea beetle species belonging to 6 genera were collected from Gölcük Natural Park, Isparta (Turkey) during 2009. The species are listed in a table together with distributional data in Turkey. Among them, *Longitarsus curtus* (Allard, 1860) is recorded for the first time in Turkey. *L. monticola* Kutschera, 1863 and *L. curtus* are recently separated synonyms and thus all data referring to the distribution of both species are currently important. Hence, the zoogeographical distribution of the new record is reviewed with some remarks; habitus and genitalia are illustrated.

Key words: Chrysomelidae, Alticinae, Malaise trap, fauna, new record, Gölcük, Turkey

INTRODUCTION

Alticinae, or flea beetles, constitutes the most species-rich and abundant group in Chrysomelidae with some 11,000 species and 600 genera worldwide, about 2400 species and 64 genera of which are represented in the Palearctic region (Konstantinov et al., 2009). Although the current knowledge about the number of Turkish flea beetle fauna is uncertain, it is supposed to have more than 300 species.

Alticinae are highly specialized phytophagous insects, feeding mainly on Lamiaceae, Brassicaceae, Scrophulariaceae, Solanaceae, Boraginaceae and Asteraceae (Jolivet and Hawkeswood, 1995; Biondi, 1996; Aslan and Gök, 2006). Some of them are serious agricultural pests through direct plant feeding or virus transmission while several species perform useful roles in the biological control of weeds (Booth et al., 1990; Jolivet and Verma, 2002). Within Chrysomelidae, Alticinae is the most commonly studied group in different regions of the world using different collecting methods, including Malaise traps (Farrel and Erwin, 1988; Basset and Samuelson, 1996; Wagner, 1999; Furth et al., 2003; Flowers and Hanson, 2003; Linzmeier and Ribeiro-Costa, 2008; 2009; Aslan and Ayvaz, 2009).

In this study, Malaise traps, open-sided tents with a collecting head generally used to catch flying or crawling beetles, were used for sampling Alticinae species. Malaise traps are not generally used for col-

lecting Alticinae; they are more often used to capture flying insects such as Hymenoptera and Diptera. Therefore, the aim of the study was to identify the flea beetle species collected by using Malaise traps compared to other standardized collecting methods.

MATERIALS AND METHODS

Study area

The survey was carried out in Gölcük Natural Park in the province of Isparta in the Mediterranean region of Turkey (Fig. 1). The area, covering a total of 5925 ha with elevations from1200-1600 m, was declared a Natural Park by the government in 1991. It is one of the important protected areas in the Lake District of Turkey with its diverse vegetation and wildlife, geomorphological structure, excellent landscape and recreational potential (Japoshvili et al., 2009). Reforestation and conservation activities were commenced by the Government in order to protect the lake and prevent over-usage of its surroundings. The reforested areas are primarily comprised of *Robinia pseudoacacia, Pinus nigra* and *Cedrus libani* populations.

Fig. 1. Location of the study area.

Sampling and identification

Insect samples were collected from March to September in 2009 using the Malaise trap method. Two Malaise traps were used in the study: one was placed at the entrance of Gölcük Natural Park (1414 m), very close to the lake and covering areas reforested with *Robinia pseudoacacia*; the other one was placed in a higher area (Pilav Tepe, 1520 m) represented by xerophilic plants with reforested areas composed of pines (*Pinus* sp.) and cedars (*Cedrus* sp.).

The Malaise traps measured approximately 1.8 m in height and 1.2 m in width. They had a white roof and black walls, and a collecting bottle containing 70% ethanol (Fig. 2). Beetles were captured in 14-day periods. Samples gathered from the traps were sorted into morphologically similar groups and transferred to jars of 75% alcohol and mounted later, or pinned promptly.

Fig. 2. General view of Malaise trap used in the study.

The specimens were identified to species under an Olympus SZ61 stereomicroscope using the taxonomic keys and figures given by Mohr (1966), Lopatin (1984), Döberl (1994), Warchalowski (2003), Čížek and Doguet (2008). The insect samples are deposited at the Biology Department of Süleyman Demirel University, Isparta.

RESULTS

Based on the material collected from Gölcük Natural Park in 2009 by Malaise traps, a total of 19 Alticinae species and 195 individuals belonging to 6 genera, including a new record for Turkish fauna, were identified. The 18 species are given below with

Table 1. Alticinae species of Gölcük Natural Park (Isparta) collected by Malaise Trap Method with individual numbers and distributional data (*).

Alticinae species	Number of individuals	Distribution records in Turkey
Aphthona Chevrolat, 1837		
A. pygmaea (Kutschera, 1861)	7	Adana, Antalya, Edirne, Erzincan, Erzurum, Isparta, Izmir, Mersin, Sakarya
A. warchalowskii Fritzlar, 2001	3	Antalya, Isparta
Chaetocnema Stephens, 1831		
Ch. arida Foudras, 1860	8	Erzurum, Isparta
Ch. hortensis (Geoffroy, 1785)	4	Adana, Ankara, Bayburt, Edirne, Erzurum, Isparta, Istanbul, Izmir, Kayseri, Konya, Sivas
Ch. tibialis (Illiger, 1807)	9	Aksaray, Ankara, Antalya, Balıkesir, Burdur, Erzincan, Eskişehir, Erzurum, Isparta, Izmir, Kocaeli, Konya, Kars, Samsun
Longitarsus Latreille, 1829		
L. albineus (Foudras, 1860)	29	Antalya, Aydın, Burdur, Erzurum, Isparta, Kayseri, Konya, Mersin, Niğde
L. luridus (Scopoli, 1763)	7	Ankara, Antalya, Artvin, Bayburt, Burdur, Eskişehir, Erzurum, Isparta, Istanbul, Kırşehir, Sivas, Yozgat
L. ochroleucus (Marsham, 1802)	23	Antalya, Burdur, Erzincan, Isparta, Izmir, Kayseri, Mersin
L. pratensis (Panzer, 1794)	2	Aksaray, Ankara, Antalya, Artvin, Erzincan, Eskişehir, Erzurum, Isparta, Istanbul, Kastamonu, Konya, Kırklareli, Rize, Sivas
L. succineus (Foudras, 1860)	31	Antalya, Erzurum, Isparta, Istanbul, Mersin
Neocrepidodera Heikertinger, 1911		
N. ferruginea (Scopoli, 1763)	2	Ankara, Antalya, Erzurum, Isparta, Istanbul, Kayseri, Konya, Sakarya
Phyllotreta Chevrolat, 1836		
Ph. erysimi Weise, 1900	10	Ankara, Antalya, Bayburt, Erzurum, Isparta, Konya, Manisa, Samsun, Trabzon
Ph. nigripes (Fabricius, 1775)	6	Adana, Ankara, Antalya, Bayburt, Bilecik, Edirne, Erzincan, Erzurum, Hatay, Iğdır, Isparta, Kayseri, Kars, Manisa, Sivas, Yozgat
Psylliodes Latreille, 1829		
P. cuprea (Koch, 1803)	9	Adana, Antalya, Artvin, Bursa, Erzincan, Erzurum, Isparta, Istanbul, Izmir, Kars, Mersin, Samsun, Trabzon
P. diversicolor Nadein, 2006	6	Antalya, Isparta, Karaman
P. hyoscyami (Linnaeus, 1758)	12	Antalya, Bayburt, Erzurum, Isparta, Konya, Sivas
P. instabilis Foudras, 1860	8	Amasya, Ankara, Antalya, Diyarbakır, Erzurum, Isparta
P. tricolor Weise, 1888	3	Ankara, Antalya, Artvin, Bayburt, Diyarbakır, Erzincan, Erzurum, Hatay, Isparta, Konya, Kayseri, Kırşehir, Nevşehir, Samsun

* Distribution records were arranged based on the following literature: Aslan, 2010; Aslan and Gök, 2006; Aslan and Ayvaz, 2009; Aslan and Warchalowski, 2001; Aslan *et al.*, 1999; Aslan *et al.* 2009; Baselga and Novoa, 2005; Gök and Çilbiroğlu, 2004; Gök and Aslan, 2007; Gruev, 2001; 2002; 2004; Nadein, 2006; Şen and Gök, 2009; Tomov and Gruev, 1975; Warchalowski, 2003.

their number of individuals and other distribution records in Turkey (Table 1). Diagnostic notes about the new record, *Longitarsus curtus* (Allard, 1860), were provided together with habitus and genitalia photos.

Among the flea beetle material collected from Gölcük Natural Park by Malaise traps, some individuals belonging to the genus *Longitarsus* were observed by the first author. Evaluation of these samples revealed that these were specimens of *Longitar-*

sus curtus, which till now was unknown in Turkey. The species is briefly reviewed below.

Longitarsus curtus (Allard, 1860)

Material examined: Isparta, Gölcük Natural Park, Pilav Tepe region, 1520 m, 21.05.2009, 2♂♂, 2♀♀; 15.10.2009, 5♂♂, 7♀♀.

General distribution: Found in a great part of Europe including the western, central and southern regions, Carpathian Basin, Luxembourg, Serbia, Sicily, Caucasus, East Siberia, Kazakhstan, Afghanistan and Tajikistan (Warchalowski, 2003; Gruev and Döberl, 2005; Löbl and Smetana, 2010).

Distribution in Turkey: Isparta (new record from Turkey).

Diagnostic notes: A generally brownish species with a shiny and finely punctuated dorsal surface; body small, short and rounded, about 1.2-1.5 mm in length; head darker, blackish-brown; antennal segments 1-5 usually yellowish, others darkened gradually; humeral calli evident, elytral suture distinct with blackish-brown coloration; apical half of hind femora dark brown, all tibia yellowish; in males first tarsal segment of fore and middle legs widened and extended; aedeagus very similar to that of *L. monticola* but clearly differs from it in lateral view; spermatheca quite typical, especially in the structure and morphology of the ductus including many loops (Fig. 3a-e).

Host plant record: It was not possible to determine the host plant association of *L. curtus* in the study area because of the collecting method. However, previous host plant records for this species were given as *Pulmonaria, Echium, Myosotis* and *Symphytum officinale* belonging to the family Boraginaceae (Gruev and Tomov, 1986; Cizek and Doguet, 2008).

Remarks: L. curtus and *L. monticola* Kutschera, 1863 were considered to be synonyms for a long time until the comprehensive study conducted by Döberl (1995) based on type specimens and series of both species. Döberl (1995) resurrected *L. monticola* from its synonymy with *L. curtus* and thus their distribution ranges are still insufficiently defined. Because both species have recently been separated, all data referring to *L. curtus* after 1995 are important in order to clarify the distribution of the species. Its record in Turkey in the present study is therefore valuable, combining the missing area between Europe and Central Asia.

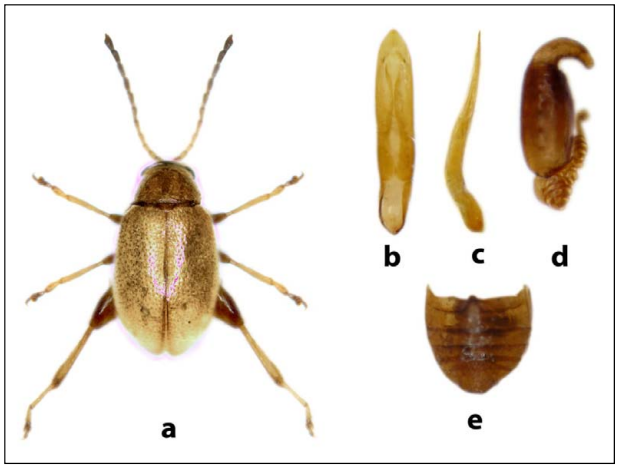

Fig. 3. Longitarsus curtus, habitus and genitalia. (a) habitus, (b) aedeagus ventral view (c) aedeagus lateral view (d) spermatheca (e) abdomen.

DISCUSSION

This study was part of a survey on the insect diversity of Gölcük Natural Park (Isparta, Turkey). As far as we know, it represents the first study of Alticinae material collected by Malaise trapping in Turkey, as opposed to sweep netting and hand collecting. Similar studies on flea beetles collected by Malaise traps have been conducted in different regions of the world, mainly including tropical rainforests (Furth et al., 2003; Linzmeier and Ribeiro-Costa, 2008; 2009).

Malaise traps are not generally used for collecting jumping beetles like Alticinae except in certain studies on the diversity of a particular area, or for the comparison of different sampling methods. The number of species recorded from the area would likely increase if classical methods were used togeth-

er with Malaise trapping. These results show that the type of the trap clearly influences the abundance and diversity of catches for Alticinae. It is known that Alticinae are highly specialized phytophagous insects, most of the species being mono- or oligophagous on a wide range of plant groups, especially the Angiospermae (Konstantinov and Vandenberg, 1996; Jolivet and Verma, 2002). This feature, i.e. their direct association with plants, makes Malaise traps relatively ineffective for the capturing of large numbers of Alticinae.

Furthermore, this study was conducted using Malaise traps which are well known for catching flying insects but are not so suitable for catching flea beetles. Additional sampling methods should be used to maximize efficient collecting of these beetles. However, our results show that the Malaise trap method can be very productive. Despite intensive collecting of Alticinae in Isparta province over a ten year-period (by the first author and other taxonomists), samples of this study contained a new record from the area not found before. It is evident that many more Alticinae species will be discovered when similar fieldwork using different collecting methods is conducted in Isparta and elsewhere in Turkey.

Acknowledgments – We would like to thank TUBITAK for supporting the project through TOVAG 107O743, part of which is reported in this study.

REFERENCES

Aslan, E. G. (2010). Comparative diversity of Alticinae (Coleoptera: Chrysomelidae) between Çığlıkara and Dibek nature reserves in Antalya, Turkey. *Biologia* **65,** 316-324.

Aslan, E. G., and *Y. Ayvaz* (2009). Diversity of Alticinae (Coleoptera, Chrysomelidae) in Kasnak Oak Forest Nature Reserve, Isparta, Turkey. *Turk. J. Zool.* **33,** 251-262.

Aslan, E. G., and *A. Gök* (2006). Host-plant relationships of 65 flea beetles species from Turkey, with new associations (Coleoptera: Chrysomelidae: Alticinae). *Ent. News* **117,** 297-308.

Aslan, I., and *A. Warchalowski* (2001). New records of the subfamily Alticinae (Coleoptera, Chrysomelidae) for the Turkish fauna. *J. Entomol. Res. Soc.* **3,** 1-4.

Aslan, I., Gruev, B., and *H. Özbek* (1999). A preliminary review of the subfamily Alticinae (Coleoptera, Chrysomelidae) in Turkey. *Turk. J. Zool.* **23,** 373-414.

Aslan, E. G., Gök, A., Gürbüz, M. F., and *Y. Ayvaz* (2009). Species composition of Chrysomelidae (Coleoptera) in Saklıkent vicinity (Antalya, Turkey) with observations on potential host plants. *J. Entomol. Res. Soc.* **11,** 7-18.

Baselga, A., and *F. Novoa* (2005). The western Palaearctic *Neocrepidodera* (Coleoptera, Chrysomelidae) of the *N. impressa* and *N. ferruginea* species groups. *Ann. Entomol. Soc. Am.* **98,** 896-907.

Basset, Y., and *G. A. Samuelson* (1996). Ecological characteristics of an arboreal community of chrysomelids in Papua New Guinea, In: *Chrysomelidae Biology 2: Ecological Studies*. (Eds. P. H. A. Jolivet, and M. L. Cox), 243-262. SPB Academic Publishing, Amsterdam, The Netherlands.

Booth, R. G., Cox, M. L., and *R. B. Madge* (1990). *Guides to Insect of Importance to Man 3*. Coleoptera. University Press, Cambridge, UK.

Cizek, P., and *S. Doguet* (2008). *Klic k urcovani drepciku (Coleoptera: Chrysomelidae: Alticinae) Ceska a Slovenska*. Mestske muzeum, Nove Mesto nad Metuji.

Döberl, M. (1994). Unterfamilie: Alticinae. In, *Die Käfer Mitteleuropas (Coleoptera: Chrysomelidae: Alticinae) 3. Supplement band* (Eds. G. A. Lohse, and W. Lucht), 17-144. Krefeld.

Döberl, M. (1995). Beitrag zur Kenntnis einiger mitteleuropäischer Alticinen (Coleoptera: Chrysomelidae: Alticinae). *Entomol. Blätter* **91,** 40-42.

Farrell, B. D., and *T. L. Erwin* (1988). Leaf-beetle community structure in an Amazonian rainforest canopy, In: *Biology of Chrysomelidae* (Ed. P. Jolivet), 73-90. Kluwer Academic Publishers, Dordrecht.

Flowers, R. W., and *P. E. Hanson* (2003). Leaf beetle (Coleoptera: Chrysomelidae) diversity in eight Costa Rican habitats, In: *Special Topics in Leaf Beetle Biology*, *Proceedings of the Fifth International Symposium on the Chrysomelidae* (Ed. D. G. Furth), 25-51. Pensoft Publishers, Moscow.

Furth, D. G., Longino, J. T., and *M. Paniagua* (2003). Survey and quantitative assessment of flea beetle diversity in a Costa Rican rainforest (Coleoptera: Chrysomelidae: Alticinae), In: *Special Topics in Leaf Beetle Biology, Proceedings of the Fifth International Symposium on the Chrysomelidae*. (Ed. D. G. Furth), 1-23. Pensoft Publishers, Moscow.

Gök, A., and *E. G. Çilbiroğlu* (2004). Some smaller genera of flea beetles (Coleoptera: Chrysomelidae) from western Turkey with a new record. *Phytoparasitica* **32,** 444-450.

Gök, A., and *E. G. Aslan* (2007). A new species of *Psylliodes* Latreille (Coleoptera: Chrysomelidae) from Turkey. *Entomol. News* **118,** 371-376.

Gruev, B. (2001). Actualized checklist of Alticinae (Coleoptera: Chrysomelidae) in the Balkan Peninsula. *Trav. Sci. Univ. Plovdiv* **37,** 9-28.

Gruev, B. (2002). A Comparative study on *Alticinae (Coleoptera: Chrysomelidae)* in the Balkan Peninsula and Asiatic Turkey. Causes of the similarities and the differences of the fauna. *Trav. Sci. Univ. Plovdiv* **38,** 49-79.

Gruev, B. (2004). The leaf beetles (Insecta: Coleoptera: Chrysomelidae) of the Sredna Gora Mountains (Bulgaria). Fauna and zoogeography. *Trav. Sci. Univ. Plovdiv* **40,** 77-96.

Gruev, B., and *V. Tomov* (1986). *Fauna Bulgarica. 16 Coleoptera, Chrysomelidae Part II Chrysomelinae, Galerucinae, Alticinae, Hispinae, Cassidinae*, In Aedibus Academiae Scientiarum Bulgaricae, Sofia.

Gruev, B., and *M. Döberl* (2005). *General Distribution of the Flea Beetles in the Palaearctic Subregion (Coleoptera, Chrysomelidae: Alticinae)*. Supplement, Pensoft Publishers, Bulgaria.

Japoshvili, G., Kaya, M., Aslan, B., and *I. Karaca* (2009). Coleoptera diversity and abundance in Golcuk Natural Park, in Isparta, Turkey. *Entomol. Hell*. **18**, 47-55.

Jolivet, P., and *K. K. Verma* (2002). *Biology of Leaf Beetles*. Intercept Publisher, Andover, UK.

Konstantinov A. S., and *N. J. Vandenberg* (1996). *Handbook of Palearctic Flea Beetles (Coleoptera: Chrysomelidae: Alticinae)*. Contributions on Entomology, International, Vol 1, Number 3, Associated Publishers, Gainesville, Florida.

Konstantinov, A. S., Korotyaev, B. A., and *M. G. Volkovitsh* (2009). Insect biodiversity in the Palearctic Region, In: *Insect Biodiversity: Science and Society* (Eds. R. G. Foottit, and P. H. Adler), 107-162. Wiley-Blackwell, Oxford, UK.

Linzmeier, A. M., and *C. S. Ribeiro-Costa* (2008). Seasonality and temporal structuration of Alticini community (Coleoptera, Chrysomelidae, Galerucinae) in the Araucaria Forest of Parana. *Brazil. Rev. Bras. Entomol*. **52,** 289-295.

Linzmeier, A. M., and *C. S. Ribeiro-Costa* (2009). Spatio-temporal dynamics of Alticini (Coleoptera, Chrysomelidae) in a fragment of Araucaria Forest in the state of Parana. *Brazil. Rev. Bras. Entomol*. **53,** 294-299.

Lopatin, I. K. (1984). *Leaf Beetles (Chrysomelidae) of the Central Asia and Kazakhstan.* Oxonian Press, New Delhi.

Löbl, I., and *A. Smetana* (2010). *Catalogue of Palaearctic Coleoptera: Chrysomeloidea, Vol 6*. Apollo Books.

Mohr, K. H. (1966). Chrysomelidae, In: *Die Kafer Mitteleuropas 9* (Eds. H. Freude, K. Harde, and G. A. Lohse), 95-299. Krefeld.

Nadein, K. S. (2006). New species of the genus *Psylliodes* Latr. (Coleoptera, Chrysomelidae) from the Palaearctic Region. *Entomol. Rev*. **86,** 931-941.

Şen, İ., and *A. Gök* (2009). Leaf beetle communities (Coleoptera: Chrysomelidae) of two mixed forest ecosystems dominated by pine-oak-hawthorn in Isparta province, Turkey. *Annal. Zool. Fenn*. **46**, 217-232.

Tomov, V., and *B. Gruev* (1975). Chrysomelidae (Col.) collected by K.M. Guichard in Turkey, Greece and Yugoslavia. *Trav. Sci. Univ. Plovdiv* **13**, 133-151.

Wagner, T. (1999). Arboreal chrysomelid community structure and faunistic overlap between different types of forests in Central Africa, In: *Advances in Chrysomelidae Biology* (Ed. M. L. Cox), 247-270. Backhuys Publishers, The Netherlands.

Warchalowski, A. (2003). *Chrysomelidae: The Leaf Beetles of Europe and the Mediterranean Area*. Warszawa: Natura optima dux Foundation.