

	SAKARYA ÜNİVERSİTESİ FEN BİLİMLERİ ENSTİTÜSÜ DERGİSİ <i>SAKARYA UNIVERSITY JOURNAL OF SCIENCE</i>		
	e-ISSN: 2147-835X Dergi sayfası: http://www.saujs.sakarya.edu.tr		
	<u>Received</u> 10-08-2017 <u>Accepted</u> 26-02-2018	<u>Doi</u> 10.16984/saufenbilder.333927	

Comparison of Leaf Beetle (Coleoptera: Chrysomelidae) Diversity of Turkey and Neighboring Countries with Respect to Species Numbers and Endemicity

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ABSTRACT

According to number of leaf beetle species and subspecies, Turkey is the most diverse country by far among its neighbors with 916 reported taxa. The species numbers of neighboring countries are as follows: Bulgaria 603, Ukraine 582, Greece 507, Romania 495, Iran 479, Russia (only the southern European part included) 441, Azerbaijan 373, Armenia 294, Georgia 273, Syria 254, Cyprus (whole island) 136, Iraq 120 and Moldova 103. As to number of endemic taxa, Iran and Turkey keep ahead with 103 and 88 endemics respectively. The closest country is Greece with 32 endemics and Moldova contains no endemic taxa. However, when we calculate the rate of endemism, Iran is unmatched with an endemism ratio of 21.50%, followed by Iraq and Turkey having 10.00% and 9.61% endemism ratios respectively.

Keywords: Chrysomelidae, biodiversity, Turkey, number of species, endemism.

1. INTRODUCTION

A criterion, maybe the best one, for understanding and evaluating the biodiversity of a particular region, is to know the species numbers dwelling there. From this point of view, this study mainly aims to compare the leaf beetle diversity of Turkey and neighboring countries with respect to species numbers and the rate of endemism. The secondary aim of the study is to determine a possible correlation between the species numbers and the surface area of selected countries.

The leaf beetles (Chrysomelidae) constitute a diverse family with about 37,000 (possibly up to 50,000) described species arranged in 19 subfamilies and more than 2000 genera all over the world. Larvae and adults of Chrysomelidae live

and feed on leaves, flowers, stems or roots. Many members of the family are phytophagous and economically important pests or biological control agents of certain weeds [1,2,3].

Thanks to its location, Turkey has a quite rich biodiversity, so rich to be compared with continents. According to IUCN data [4], Europe has 12.500 plant species while 11.000 present only in Anatolia, and one third of these species are endemics. 1.500 vertebrate species (over 100 endemics) and more than 20.000 invertebrate species (about 4.000 endemics) are present in Turkey. Turkey is located in the middle of three biodiversity hotspots. These are Mediterranean basin, Caucasus and Irano-Anatolian hotspots. These hotspots make the area very important for biological biodiversity and conservation.

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Turkey has many neighbors either by land or sea. The main purpose of this paper is to compare the leaf beetle diversity of these countries. Totally 14 countries are involved and compared: Turkey, Greece, Bulgaria, Romania, Moldova, Ukraine, Russia (South European part), Georgia, Armenia, Azerbaijan, Iran, Iraq, Syria and Cyprus Island.

of all countries are calculated and compared. The number of total taxa and endemics are than evaluated considering the total surface area (data taken from the website of FAO) of each country. Statistical analysis is performed via Excel 2010 software.

2. MATERIAL AND METHODS

The neighboring countries of Turkey are selected according to contiguity either by land or sea. Totally 14 countries are included. Total number of leaf beetles (species and subspecies) reported from each country is determined by reviewing the relevant literature [5,6,7,8,9,10,11,12,13], as well as the number of endemics. The endemism rates

3. RESULTS AND DISCUSSION

Within these 14 countries, Turkey is the most diverse country with 916 leaf beetle taxa (including species and subspecies, and also including seed beetles, a subfamily of leaf beetles) [5,6,7,8,9,10,11]. The leaf beetle and seed beetle numbers of the neighbors are as in the Table 1 [5,12,13].

Table 1. The number of leaf beetle taxa of Turkey and neighboring countries

Countries	N. of leaf beetle taxa	Number of endemics	Endemism ratio (%)
Turkey	916	88	9.61
Bulgaria	603	10	1.66
Ukraine	582	6	1.03
Greece	507	32	6.31
Romania	495	17	3.43
Iran	479	103	21.50
Russia (S. Europe)	441	11	2.49
Azerbaijan	373	5	1.34
Armenia	294	12	4.08
Georgia	273	9	3.30
Syria	254	9	3.54
Cyprus Island	136	2	1.47
Iraq	120	12	10.00
Moldova	103	0	0

When we come to numbers of endemic leaf beetles (Table 1), Turkey still has a considerable number of endemics but here Iran has a spectacular number of endemic taxa [5,6,12]. Other prominent country is Greece [5]. Moldova has no endemics [5]. An interesting result is that, although it is an island, Cyprus has only two endemics [5]. This maybe shows a strong contact with the motherland Anatolia. When we look at the species numbers and endemic taxa numbers together, Iran and

Turkey stand out at first, but some important data about the endemism ratios must also be caught within the Table. When we look at the endemism ratios, Iran and Turkey are still prominent, but Iraq also has a high number of endemism ratio. Iraq has only 120 species and 10% of them are endemics. The actual number of taxa and endemism ratios of countries are given together in Figure 1. The three peaks that draw attention at first sight are Iran (21.50%), Iraq (10%) and Turkey (9.61%).

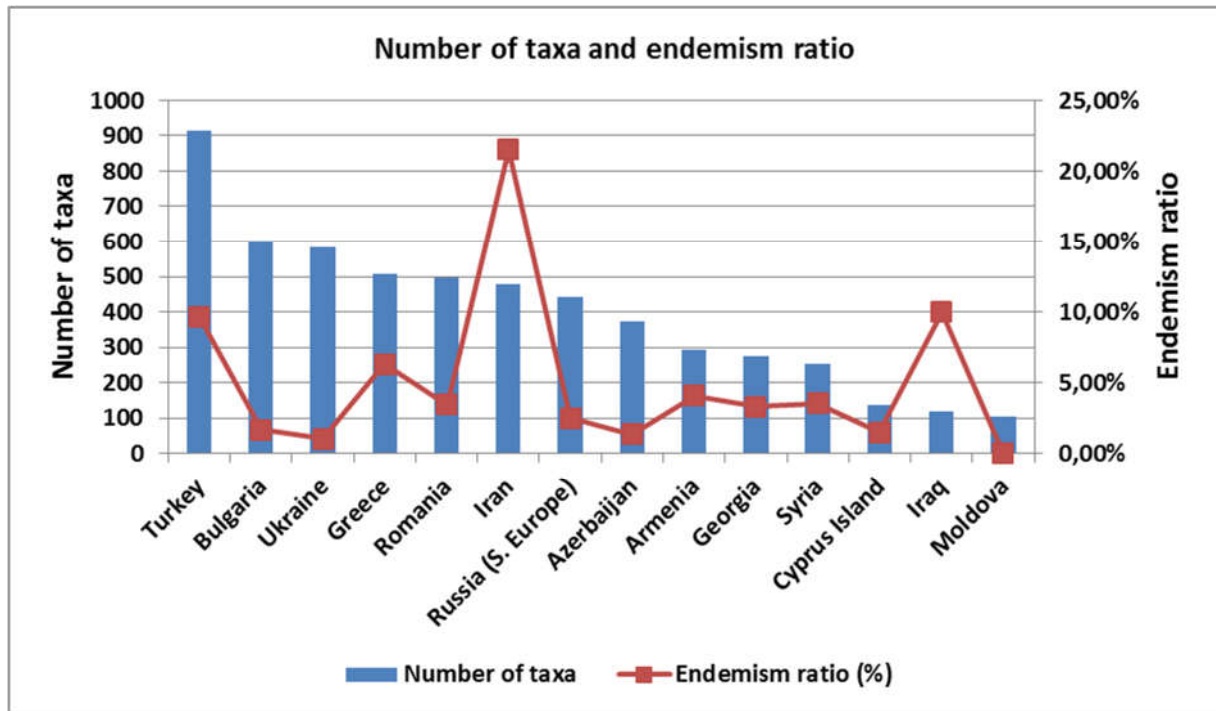


Figure 1. Number of taxa and endemism ratios (only the Southern European part of Russia is included)

One may expect more diverse habitat types in larger areas and thus more species numbers. The surface areas of the countries included in this study are taken from the web site of FAO [14]. The surface area of Russia is omitted from the analysis because only the Southern European part is involved in this study. Normally, there should be a correlation between the surface area and the number of species a country has. However, when we correlate these two variables, we see a weak

insignificant correlation ($r=0.41, p>0.05$) (Figure 2, left). The results belonging to Iran greatly deviates from the regression line. Iran is a very large country with diverse climatic factors and habitats but the reported leaf beetle diversity is not rich as expected. This is most likely a result of low number of field studies on leaf beetles. As to my knowledge, recently the faunistic works on leaf beetles are increasing and I believe that the numbers will increase also.

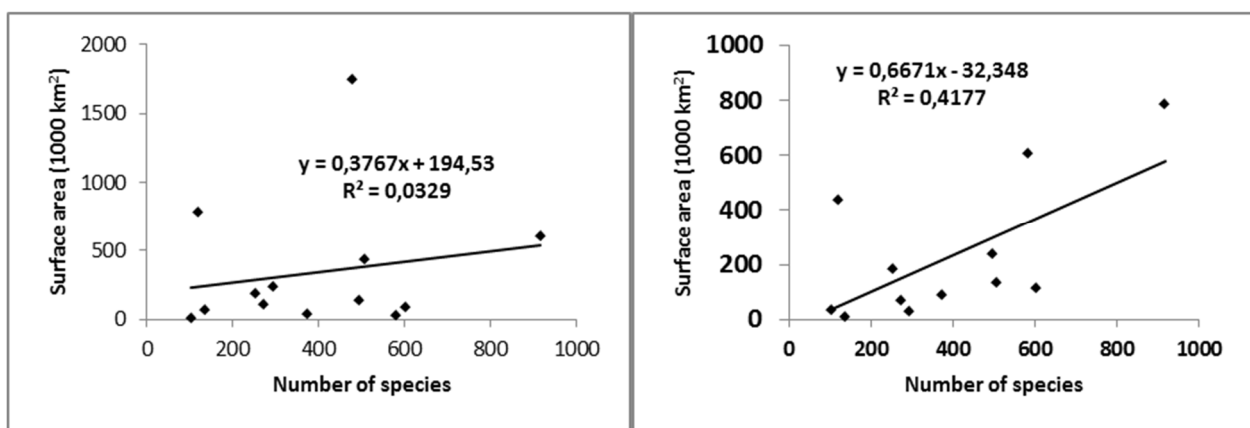


Figure 2. Correlation between the surface area and the number of taxa. (left, Iran is included; right, Iran is excluded)

When we exclude Iran from the data set (Figure 2, right), the correlation between the surface area and number of species increases and there is a modest positive correlation between these two variables ($r=0.65, p<0.05$).

ACKNOWLEDGEMENTS

This paper is presented as an oral presentation in SEAB-2016 (Symposium on Euroasian Biodiversity) held in Antalya, Turkey on 23-27 May 2016, and included in the abstract book.

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