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New Data of Ground Beetles (Coleoptera: Carabidae) in Tunisia

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ABSTRACT

A faunistic survey was carried out on ground beetles (Insecta, Carabidae) over the course of 2012-2013 in four localities from Northern Tunisia. Insects were collected mostly by hand and pitfall traps. The habitat preferences of ground beetle species are also discussed. In total 65 species belonging to 45 genera, 24 tribes, and nine subfamilies were found, whose six species are new records for Tunisia and seven species are endemic to northern Africa. The present study gives new faunistic data and better knowledge on the biogeography of Tunisia.

Key words: Carabidae, taxonomy, new records, endemic, distribution, Tunisia.

INTRODUCTION

The family Carabidae, or ground beetles, currently includes about 40,000 (Thiele, 1977) to 50.000 species (Desender, 1987) but some authors consider it could be about 60,000 species (Gaston, 1991). Carabidae are the most abundant beetle families (Dajoz, 2002). They are located in all terrestrial habitats and represent a major part of the invertebrate predator for the soil fauna (Arndt *et al.,* 2011). Their evolutionary differentiation took place during the Quaternary ice ages (Palestrini *et al.,* 2012). Studies on the distribution and survival of many Carabidae species in different habitats serve to consolidate our level of knowledge of the environmental and climate change (Kerr *et al.,* 2007; Vaibhao *et al.,* 2013). They are one of the three richest families of extant beetles (Lorenz, 2005) and are important bioindicators for assessment the effect of anthropogenic impact on the terrestrial ecosystem (den Boer, 1977; Butovsky, 1997; Butovsky *et al*., 1999; Brandmayr *et al.,* 2005; Lagisz and Laskowski, 2008; Schirmel *et al.,* 2015; Ghannem *et al.,* 2016; Simon *et al.,* 2016). However, as they are predators of terrestrial invertebrates and, at the same time can be part of the diet of vertebrates (amphibians, reptiles, birds) they can play a key role in clarifying the route of toxic elements in food chain (Butovsky, 2011). These animals have been used in studies of several terrestrial habitats (grassland, forest, agro-ecosystems, and even roadside) in the assessment of human impacts on terrestrial ecosystems (Andrews and Cooke, 1984; Beyer *et al.,* 1985; Butovsky, 1994; Jelaska *et al.,* 2007; Purchart and Kula, 2007). This group of invertebrates is frequently used for ecotoxicological

analysis for the reason of its strong ability to be found in all types of terrestrial environments (Conti *et al.,* 2017). Carabidae beetles consume a wide assortment of soil arthropods (caterpillars, wireworms, maggots, ants, aphids and slugs), are also feeding on seeds during its development. They considered as one of the regulating agents of weed populations (Liebman and Gallandt, 1997). One of the most daunting tasks challenging an aspiring entomologist is the identification of species within a family as diverse as carabids (Choate, 2001). This family is characterized by a very wide adaptive success on the multiple ecological conditions encountered on the scale of the globe. According to Moret (2003) and based on their great diversity, Carabidae are a suitable taxonomic group for ecological and biogeographical studies. Their high endemism, the inability to fly of most of Carabidae species and their restricted geographic distribution is a key element to define areas of endemism (Moret, 2000). In addition, they are easy to sample using several collecting techniques. They can be found under stones or in the middle of the pillow vegetation. At night, when they leave to hunt, it will be easy to collect them using a flashlight or using pitfall traps. Species checklists are effective tools in the domain of natural science. They serve to consolidate our level of knowledge and at the same time indicate areas in need of further survey. The fauna of Carabidae of Tunisia is rather unknown in comparison to Europe as well as other zoogeographical areas. Only a few studies cover the topic of ground beetles in Tunisia. Good examples are so far Bedel (1895), Peyerimhoff (1909) and Normand (1933), recent work leading to the discovery of new species (Gueorguiev, 2012; Queinnec and Ollivier, 2012; Ghannem e*t al.,* 2015), and that prompted us to make a new contribution and update the list of ground beetles in Tunisia.

The aim of our study was to analyze spatial patterns in the species richness of carabids in order to achieve a better knowledge of the ground beetles of Tunisia.

MATERIAL AND METHODS

Study area

The materials for this study were collected from various habitats between the years 2012 and 2013. The study areas (four sites) are located in Northern Tunisia. GPS coordinates altitudes and morphodynamic characteristics of the study areas are listed in Table 1.

Sampling procedure

The specimens were sampled by pitfall traps (diameter 10 cm, height 12 cm). We used 10 containers per locality, separated about 5m and buried in a way that the microhabitat do not look like modified to facilitate the insect catch. Each pot was partially filled with acetic acid diluted at 30% to kill and preserve samples. Sampling was biweekly in March, April, May and June, and the beetles were collected, separated, and identified. Additional specimens were collected directly by hand while walking through the area of study. Dates, locations, and number of specimens were recorded. Beetles were stored in the collection of the first author in the Faculty of Sciences of

Bizerte, University of Carthage, Tunisia. The biological materials were identified using literature carry out by specialists: Bedel (1895), Antoine (1955-1957-1959-1961-1962), and by comparison with the collection of Peyerimhoff at the National Museum of Natural History, Paris, France (NHMP) and later confirmed by some experts (see Acknowledgements).

The new records are marked in the list by an asterisk (*****).

In general, for practical reasons we suggest in our study using the highest classification suggested by Bouchard *et al*. (2011) and for the genus level and species names we have followed the Palearctic catalogue (Löbl and Smetana, 2003).

Table 1. Main characteristics of study areas.

Site	Geographical coordinates	Altitude, m a.s.l.	Habitat
Ras Injla	37°20' 23.55" N 9°44' 54.05" E	14	It is located in northern Tunisia, only 8 km to the south-east of the city of Bizerte, near to the sea. The site is characterized by forest plantations (*Acacia Cyclops* A. Cunn. ex G. Don, 1832, *Acacia cyanophylla* Lindl, 1839, *Pinus pinaster* Aiton, 1789, *Pinus pinea* Linnaeus, 1753, *Pinus halepensis* Mill. 1768 and *Eucalyptus* sp. Hook, 1844). Existing and especially shrubs and herbaceous vegetation, found mostly Juniper, whether Phoenician, or oxycedre (*Juniperus Phoenicia* Linnaeus, 1753, *Juniperus oxycedrus* Linnaeus, 1753, *Ephedra fragilis* Moris, 1828 and *Matthiola tricuspidata* R.Br. 1812.)
Sidi Nsir	36°53'671''N 009°26'648'' E	218	Located in the northern part of Tunisia, breeding ground wheat (*Triticum aestivum* Linnaeus, 1753) on the main road Beja-Mateur, crossed by a permanent watercourse. This environment is characterized by forest plantations of Acacia and Eucalyptus, including *Eucalyptus* sp. Hook, 1844 and *Acacia Cyclops* A.Cunn.ex G.Don, 1832.
Ain Draham	36°47'17.14"N 8°40'47.72" E	800	This region is the most humid area of Tunisia for holding the national rainfall record with 1,534 millimeters of precipitation per year. Plantation: Forest cork oak or oak Zen (we usually at Tribeted to *Quercus suber* Linnaeus, 1753 and *Quercus mirbecki* Durieu ex Bory, 1846). Without limestone soils, is presented with characteristic soils leached mull. In the litter including forming a continuous sheets cork oak and oak litter Zen, is light textured topsoil, blackish, heavily penetrated by the roots, with a richness organic substances declining with depth
Cap Serrat	37°14'25"N 9°12'33.5"E	108	This region is characterized by an alternation of sandy areas and steep areas. Ecosystem Cap Serrat is belonging to the field of Montado vegetation cork oak. They are in the form of forests, matorral of varying height and grassy erme (thermo-Mediterranean Cork Oak Landscapes floor includes bass altitude where the lentisk is abundant and Montado his matorral and ermes used for grazing livestock farmers).At the level of interdunal depressions evolve hydromorphic gley soils and permanent water shallow. The vegetation is characterized by *Cutandia maritime* Barbey, 1885, *Crucianella maritime* Linnaeus, 1753

RESULTS

The investigated area gives data on 65 species from 45 genera, 24 tribes, and nine subfamilies found in North Tunisia. The registered taxa are listed below. All registered species belong to the following subfamilies: Nebriinae (with two tribe, two genera, and two species), Cicindelinae (with one tribe, two genera, and two species), Carabinae (one tribe, one genera, and one species), Omophroninae (one tribe, one genera, and one species), Scaritinae (with three tribe, four genera, and five species), Siagoninae (with one tribes, one genera, and one species), Trechinae (with three tribe, four genera, and 12 species), Brachininae (with one tribe, one genera, and six

species) and Harpalinae (with 10 tribes, 28 genera, and 35 species). The species and subspecies that belonged to subfamilies and tribes are presented in the following list.

Subfamily Nebriinae Laporte, 1834

Tribe Nebriini Laporte, 1834

Genus *Nebria* Latreille, 1802

***Nebria (Nebria) andalusia variabilis* Lucas, 1842**

Material examined. Sidi Nsir: 2♂♂, 1♀; 11. 04. 2012.

Collection circumstances: The specimen was found underneath stone and leaves.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco. Europe: Italy, Portugal, Spain; (Löbl and Smetana, 2003).

Tribe Notiophilini Motschulsky, 1850

Genus *Notiophilus* Duméril, 1806

***Notiophilus geminatus* Dejean, 1831**

Material examined. Ras Injla: 2♀♀, 31. 06. 2012; Ain Draham: 1♂♂, 2♀♀; 23. 03. 2013.

Collection circumstances: Species collected in a fresh environment, between roots, under wood, stones and dead leaves. He lives in a variety of environments. Although the number of places where it was detected, it reflects the diversity of the conditions mentioned because they are captured at the same time in zones wet and in others sunny and dry, which suggests that it is a species with a big capacity of adaptation.

Geographical distribution. North Africa: Tunisia, Algeria, Morocco, Canary Island. Europe: France, Greece, Italy, Spain. Asia: Syria (Bedel, 1895; Antoine, 1955; Löbl and Smetana, 2003).

Subfamily Cicindelinae Latreille, 1802

Tribe Cicindelini Latreille, 1802

Genus *Cicindela* Linnaeus, 1758

***Cicindela* (str.) *campestris* Linnaeus, 1758**

Material examined. Ain Draham: 2 ♂♂, 1♀, 04. 05. 2012.

Collection circumstances: The species was collected, especially on shrubs in soil free of limestone.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco. Europe: Italy, Spain, France, Portugal (Bedel, 1895; Antoine, 1955; Löbl and Smetana, 2003). The range of this species is an example of chorotype Palearctic (Serrano, 2003).

Genus *Lophyra* Motschulsky, 1859

***Lophyra flexuosa* (Fabricius, 1787)**

Material examined: Ras Injla, 7♂♂, 5♀♀, 31. 06. 2012; Cap Serrat, 7♂♂, 6♀♀, 31.06.2012.

Collection circumstances: They were generally collected on sandy grounds and dunes, near the sea and lakes, sometimes along the river banks.

Geographical distribution: North Africa: Tunisia, Algeria, Egypt, Libya, Morocco. Europe: France, Italy, Portugal, Spain, Switzerland. Asia: Syria (Bedel, 1895; Antoine, 1955; Löbl and Smetana, 2003).

Subfamily Carabinae Latreille, 1802

Tribe Carabini Latreille, 1802

Genus *Macrothorax* Desmaret, 1850

***Macrothorax morbillosus* (Fabricius, 1792)**

Material examined. Ras Injla, 1♂♂, 3♀♀, 31.06.2012; Sidi Nsir, 4♂♂, 3♀♀, 11.04.2012.

Collection circumstances: These species were collected under stones, in the woods and in snail shells.

Geographical distribution: All of North Africa. Europe: Spain, Italy (Sicily, Sardinia), France (Bedel, 1895; Antoine, 1955; Machard, 1997; Löbl and Smetana, 2003).

Subfamily Omophroninae Bonelli, 1810

Tribe Omophronini Bonelli, 1810

Genus *Omophron* Latreille, 1802

***Omophron limbatum* Fabricius, 1776**

Material examined: Cap Serrat, 2♂♂, 3♀♀, 22.04.2013; Ras Injla, 2♂♂, 1♀♀; 13.05.2013.

Collection circumstances: Species captured in sandy soil near water course.

Geographical distribution: North Africa: Tunisia, Algeria. Europe: Spain, France, Italy (incl Corsica and Sicily.), Montenegro, Serbia, Slovenia, Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Turkey (incl Crete) (Löbl and Smetana, 2003; Valainis, 2009).

Subfamily Scaritinae Bonelli, 1810

Tribe Clivinini Rafinesque, 1815

Genus *Clivina* Latreille, 1802

***Clivina ypsilon* Dejean and Boisduval, 1829**

Material examined. Cap Serrat, 2♂♂, 3♀♀, 22.03.2013; Ras Injla,1♂; 12.04.2013.

Collection circumstances: Hidden under stones and plant residues in a wet and coastal zone.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco (Löbl and Smetana, 2003).Western Mediterranean from Sicily to Spain, Central Europe (Kapla, 2004).

Tribe Dyschiriini Kolbe, 1880

Genus *Dyschirius* Bonelli, 1810

***Dyschirius numidicus* Putzeys, 1846**

Material examined. Cap Serrat, 2♂♂, 1♀, 11.06.2012, Ras Injla, 1♂, 3♀♀, 29.06.2012.

Collection circumstances: Collected in the sand of the coast.

Geographical distribution: North Africa: Tunisia, South Algeria, Morocco, Egypt (Antoine, 1955). The western Mediterranean, on the coast of the Mediterranean Sea from Spain, France and Italy (Fedorenko, 1996).

Tribe Scaritini Bonelli, 1810

Subtribe Scaritina Bonelli, 1810

Genus *Distichus* Motschoulsky, 1857

***Distichus planus* (Bonelli, 1813)**

Material examined: Cap Serrat, 7♂♂, 8♀♀; 22.04.2013; Ras Injla, 12♂♂, 11♀♀; 13.05.2013.

Collection circumstances: Wide spread species on sandy beaches.

Geographical distribution: North Africa: Tunisia, Egypt, Morocco. Europe: Spain, Italy, Corsica (Löbl and Smetana, 2003).

Genus *Scarites* Fabricius, 1775

***Scarites* (*Parallelomorphus*) *laevigatus* Fabricius, 1792**

Material examined. Ras Injla, 9♂♂, 13♀♀, 21.06. 2012; Cap Serrat, 5♂♂, 2♀♀, 23.03. 2013.

Collection circumstances: Halophiles insects living on the coastal beaches, especially at the mouths of rivers and on the wet sand.

Geographical distribution: North Africa: Tunisia, Algeria, Egypt, Morocco (Löbl and Smetana, 2003). Europe: Spain, Italy, Greece, Slovenia, Portugal. It is an element and Mediterranean coasts of the Black Sea (Magistretti, 1965).

***Scarites* (*Scallophorites*) *striatus* Dejean, 1825**

Material examined. Ras Injla, 4♂♂, 3♀♀, 31.06. 2012.

Collection circumstances: Species collected on the sand.

Geographical distribution: North Africa: Tunisia, Algeria, Libya, Egypt. Asia: Saudi Arabia (Löbl and Smetana, 2003).

Subfamily Siagoninae Bonelli, 1813

Tribe Siagonini Bonelli, 1813

Genus *Siagona* Latreille, 1804

***Siagona rufipes* Fabricius, 1792**

Material examined. Sidi Nsir, 1♂, 11. 04. 2012.

Collection circumstances: Species collected in a clay ground under a stone.

Geographical distribution: Endemic to North Africa, mainly distributed in Tunisia, Algeria, Morocco (Antoine, 1955; Löbl and Smetana, 2003).

Subfamily Trechinae Bonelli, 1810

Tribe Bembidiini Stephens, 1827

Subtribe Bembidiina Stephens, 1827

Genus *Asaphidion* Gozis, 1886

***Asaphidion stierlini* (Heyden, 1880)**

Material examined: Ain Draham, 2♂♂, 4♀♀, 04.05. 2012.

Collection circumstances: Species collected in edges of running water.

Geographical distribution: North Africa: Tunisia, Morocco. Europe: Austria, Belgium, France, Great Britain, Germany, Greece, Italy, Netherlands, Spain (Löbl and Smetana, 2003).

Genus *Bembidion* Latreille, 1802

***Bembidion quadrimaculatum quadrimaculatum* Linnaeus, 1761**

Material examined: Ras Injla, 1♂, 2♀♀, 04.05. 2012; Cap Serrat, 2♀♀, 24.06. 2012.

Collection circumstances: Species found at the edge of puddles.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco. Europe: Italy (Sardinia) (Bonavita and Taglianti, 2005)

***Bembidion (Testedium) bipunctatum* (Linnaeus, 1761)**

Material examined: Ain Draham, 3♂♂, 5♀♀, 05.05. 2013.

Collection circumstances: Species collected along streams.

Geographical distribution: North Africa: Algeria, Morocco. Europe: Italy, Spain, France, Great Britain, Germany. Asia: Turkey (Bedel, 1895; Antoine, 1955; Löbl and Smetana, 2003).

******Bembidion (Actedium) kuesteri* **Schaum, 1845**

Material examined: Ain Draham, 2♂♂, 4♀♀, 22.05.2013; Cap Serrat, 3♀♀, 12.03.2013.

Collection circumstances: Mediterranean coast, and at the mouths of rivers.

Geographical distribution: North Africa: Algeria, Morocco. Europe: Italy (Sardegna), France (Bedel, 1895; Antoine, 1955; Löbl and Smetana, 2003).

Bembidion (Nepha) callosum **Küster, 1847**

Material examined: Ain Draham, 2♂♂, 5♀♀, 04.05. 2012; Cap Serrat, 2♂♂, 1♀, 4.06.2012.

Collection circumstances: Species found in wet soil near a stream.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco (Antoine, 1955; Löbl and Smetana, 2003).

Bembidion (Nepha) genei **(Küster, 1847)**

Material examined: Ain Draham, 2♂♂, 1♀, 04.05.2012; Cap Serrat, 1♂, 3♀♀, 14.06. 2012.

Collection circumstances: The species was found at the edge of ponds, rivers and streams.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco. Europe: France, Greece, Italy, Portugal, Spain, Italy (Sardinia) (Bonavita and Taglianti, 2005).

Bembidion (Phyla) tethys **(Netolitzky, 1926)**

Material examined: Ras Injla, 3♀♀, 21.VI. 2012; Cap Serrat, 3♂♂, 4♀♀, 14.VI. 2012.

Collection circumstances: The specimen was found at the edge of the water.

Geographical distribution: North Africa: Algeria, Libya, Morocco, Tunisia. Europe: Bosnia and Herzegovina, Croatia, France, Italy, Malta, Portugal, Spain, Yugoslavia (Serbia, Montenegro); Asia: Turkey (Löbl and Smetana, 2003).

Bembidion (Ocyturanes) dudichi **(Csiki, 1928)**

Material examined: Ain Draham, 11♂♂, 9♀♀, 04.05. 2012.

Collection circumstances: These species were collected in streams of sand edge.

Geographical distribution. North Africa: Algeria, Morocco, Tunisia. Europe: Spain, France, Portugal (Antoine, 1955; Löbl and Smetana, 2003).

Bembidion (Ocyturanes) praeustum **Dejean, 1831**

Material examined: Ain Draham, 2♀♀, 04.05. 2012.

Collection circumstances: Species harvested at the edge of a stream in sandy soil.

Geographical distribution. North Africa: Tunisia, Egypt, Libya. Europe: continental Italy and Sicily (Neri *et al.,* 2010).

***Bembidion (Neja) cirtense* Netolitzky, 1914**

Material examined: Ain Draham, 3♀♀, 04.05. 2012.

Collection circumstances: Located at the edge of rivers and streams.

Geographical distribution: Endemic species for North Africa, distributed in Tunisia and Algeria (Löbl and Smetana, 2003).

Subtribe Tachyina Motschulsky, 1862

Genus *Sphaerotachys* Müller, 1926

***Sphaerotachys haemorrhoidalis* (Ponza, 1805)**

Material examined: Cap Serrat, 1♂, 4.VI.2012.

Collection circumstances: Species found in zones of sand on the banks of running water and under stones in a wet salty ground.

Geographical distribution: North Africa: Tunisia, Morocco, Canary Island, Egypt. Europe: Spain, Italy, France (Löbl and Smetana, 2003).

Tribe Pogonini Laporte, 1834

Genus *Pogonus* Dejean, 1821

***Pogonus* (str.) *littoralis* Duftschmid, 1812**

Material examined: Sidi Nsir, 2♂♂, 3♀♀, 11.04 2012; Ras Injla, 1♂, 2♀♀, 11.05. 2012.

Collection circumstances: It was found under a stone near a permanent stream near an agricultural field.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco. Europe: Belgium, Bulgaria, France, Greece, Italy, Moldova, Netherlands, Romania, Spain, the European territory of the South, Ukraine; Asia: Syria, Turkey (Löbl and Smetana, 2003).

Tribe Trechini Bonelli, 1810

Subtribe Trechina Bonelli, 1810

Genus *Trechus* Clairville, 1806

***Trechus obtusus* Erichson, 1837**

Material examined: Ain Draham, 2 ♂♂, 1♀, 04. 05. 2012.

Collection circumstances: Species hygrophile collected under dead leaves.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco. Europe. Spain, Italy, France (Zaballos, 1993; Löbl and Smetana, 2003).

Subfamily Brachininae Bonelli, 1810

Tribe Brachinini Bonelli, 1810

Subtribe Brachinina Bonelli, 1810

Genus *Brachinus* Weber, 1801

***Brachinus* (str.) *efflans* Dejean and Boisduval, 1829**

Material examined: Sidi Nsir: 1♂, 2♀♀, 08.III.2012.

Collection circumstances: The species were found under a stone in a wet field, near a farm field and a permanent water course.

Comments on classification: The former citations of *B. efflans* Dejean and Boisduval from Tunisia are included as a variety of *Brachinus crepitans* L. (Bedel, 1895) from Haïdra and under the synonym *Brachinus etslans* Dejean.

Geographical distribution: Mediterranean element (Ruiz-tapiador and Zaballos, 2001), Bulgaria, Italy, Portugal, Spain, Syria, Western Morocco, from Casa Blanca to Tangier and the Middle Atlas (Machard, 1997), Algeria, Tunisia (Löbl and Smetana, 2003).

***Brachinus* (str.) *crepitan* Linnaeus, 1758**

Material examined: Sidi Nsir, 2♂♂, 1♀, 08.03.2012.

Collection circumstances: Species found under vegetation debris.

Geographical distribution: North Africa, Tunisia, Algeria, Morocco.Middle and southern Europe. Asia: Syria (Bedel, 1895).

***Brachinus (Brachinus) psophia* Serville, 1821**

Material examined: Cap Serrat, 1♂, 3♀♀, 13.03.2013; Ras Injla, 2♂♂, 4♀♀, 06.04.2013.

Collection circumstances: Species collected at the edges of the river, especially near their mouths.

Geographical distribution: North Africa: Algeria, Morocco. Southern Europe: Spain, Italy, France, Portugal (Löbl and Smetana, 2003).

***Brachinus (Brachynolomus) immaculicornis* Dejean, 1825**

Material examined: Cap Serrat, 1♂, 2♀♀, 08.03.2012.

Collection circumstances: Species collected under a stone in a clay-humus ground.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco. Europe: Spain, Italy, France (Löbl and Smetana, 2003).

***Brachinus* (*Brachynoaptinus*) *mauretanicus* Bedel, 1914**

Material examined: Cap Serrat, 2♂♂, 3♀♀, 23.03.05.2013; Ain Draham, 1♂, 2♀♀, 21.02.2013.

Collection circumstances. Species found under stones and plant debris in wet clay soil.

Geographical distribution. Endemic to North Africa. Moroco, Tunisia (Bedel, 1895, Antoine, 1955).

***Brachinus (Cnecostolus) humeralis* Ahrens, 1812**

Material examined: Ain Draham, 2♂♂, 1♀, 26.02.2013.

Collection circumstances: Species found under vegetation debris and under stone.

Geographical distribution: North Africa: Algeria, Morocco, Tunisia. Europe: Spain, Italy, France (Bedel, 1895; Antoine, 1955; Löbl and Smetana, 2003).

Subfamily Harpalinae Bonelli, 1810

Tribe Chlaeniini Brullé, 1834

Subtribe Chlaeniina Brullé, 1834

Genus *Chlaenites* Motschoulsky, 1860

***Chlaenites spoliatus* (Rossi, 1792)**

Material examined: Sidi Nsir, 2♂♂, 3♀♀, 24.02.2012.

Collection circumstances: These species have been found in flooded terrain under plant debris.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco, Canaries Island, Libya, Egypt. All moderate and Southern Europe and Central Asia (Antoine, 1955; Machard, 1997; Löbl and Smetana, 2003).

Genus *Chlaenius* Bonelli, 1810

***Chlaenius velutinus* ssp *auricollis* Géné, 1839**

Material examined: Sidi Nsir, 2♂♂, 1♀, 11. 04.2012.

Collection circumstances: These species were collected under stones and roots of vegetables.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco, Mauritania. Europe: Spain, Italy (Sicily and Sardinia), France, Portugal, Greece, Germany (Antoine, 1955; Machard, 1997; Serrano, 2003; Löbl and Smetana, 2003).

Genus *Trichochlaenius* Seidlitz, 1887

***Trichochlaenius chrysocephalus* (Rossi, 1790)**

Material examined: Sidi Nsir, 3♂♂, 1♀, 26.II.2012.

Collection circumstances: Species collected in the edges of stagnant waters, under

stones. It is a species of meso-hygrophilous behavior. In the study area we sometimes notice a gregarious behavior and are frequently captured by living together with diverse species of *Brachinus* Weber, a similar behavior marked by Therond (1975), who emphasizes that in winter this tendency is more marked.

Geographical distribution. North Africa: Tunisia, Algeria, Morocco. Europe: Spain, Italy, Portugal, Greece, France (Antoine, 1955; Löbl and Smetana, 2003).

***Trichochlaenius aeratus varvasi* Laporte, 1834**

Material examined: Sidi Nsir, 2♂♂, 5♀♀, 11.04.2012.

Collection circumstances: These species were collected under stones in a wet clay soil.

Geographical distribution: Endemic to North Africa: Tunisia, Algeria, Morocco (Serrano, 2003).

Tribe Dryptini Bonelli, 1810

Genus *Drypta* Latreille, 1796

***Drypta dentata* (Rossi, 1790)**

Material examined: Ain Draham, 1♀, 12. 02. 2013.

Collection circumstances: This species is collected under plant debris in wet ground.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco, Egypt (Bedel, 1895; Antoine, 1955; Löbl and Smetana, 2003).

Tribe Graphipterini Latreille, 1802

Genus *Graphipterus* Latreille, 1802

***Graphipterus serrator* Forsskal, 1775**

Material examined: Ras Injla 2♂♂, 5♀♀, 31.06.2012.

Collection circumstances: These species were collected on the coast around the turfs and captured around small knolls of sand. Insect xerophile, short sunlight and ran stridulates.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco, Egypt, Libya, Mauritania (Bedel, 1895; Antoine, 1955; Machard, 1997).

Tribe Harpalini Bonelli, 1810

Subtribe Anisodactylina Lacordaire, 1854

Genus *Scybalicus* Schaum, 1862

***Scybalicus oblongiusculus* Dejean, 1829**

Material examined: Sidi Nsir, 2♀♀, 11.03. 2012.

Collection circumstances. The species was found buried in wet ground.

Geographical distribution. North Africa: Tunisia, Algeria, Morocco. Western Europe (Gibraltar to England); Italy (Sicily) (Bedel, 1895; Machard, 1997; Löbl and Smetana, 2003).

Subtribe Harpalina Bonelli, 1810

Genus *Carterus* Dejean, 1829

***Carterus* (str.) *rotundicollis* Rambur, 1837**

Material examined: Sidi Nsir, 1♂♂, 3♀♀, 11. IV. 2012.

Collection circumstances: The specimen was collected under stones in wet clayey soils.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco. Europe: Spain, Italy, Portugal (Bedel, 1895; Antoine, 1955; Machard, 1997).

***Carterus* (str.) *interceptus* Dejean**

Material examined: Sidi Nsir, 2♂♂, 11. IV. 2012.

Collection circumstances: Species found in wet clay soil under stones.

Geographical distribution. North Africa: Tunisia, Algeria, Morocco. Europe: Spain, Portugal (Bedel, 1895 ; Löbl and Smetana, 2003).

Genus *Graniger* Motschoulsky, 1864

***Graniger cordicollis* Serville, 1821**

Material examined. Sidi Nsir, 2♀♀, 11. 04. 2012.

Collection circumstances: This species is collected under a stone in a wet ground.

Geographical distribution: North Africa: Algeria, Morocco, Tunisia. Europe: Spain, Armenia, Bulgaria, Croatia, France, Greece, Italy, Malta, Portugal (Löbl and Smetana, 2003).

Genus *Harpalus* Latreille, 1802

***Harpalus* (*Pseudophonus) rufipes* (De Geer, 1774)**

Material examined: Sidi Nsir, 2♂♂, 3♀♀, 14. 04. 2012.

Collection circumstances: Species collected under stones in wet ground and under pieces of wood.

Geographical distribution: North Africa: Tunisia, Algeria Morocco. Europe: France, Germany, Portogal, Spain (Löbl and Smetana, 2003).

***Harpalus* (str.) *distinguendus* (Duftschmid, 1812)**

Material examined: Ain Draham, 2♂♂, 27. 05. 2012.

Collection circumstances: These species were collected under stones and vegetable debris.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco. Middle Europe, Caucasus, Asia Minor (Antoine, 1955; Löbl and Smetana, 2003; Wrase, 2009).

Genus *Parophonus* Ganglbauer, 1892

***Parophonus hispanus* Rambur, 1838**

Material examined: Sidi Nsir, 4♂♂, 1♀♀, 11. 04. 2012.

Collection circumstances: The specimen was found on sandy soil between the debris of vegetation.

Geographical distribution: North Africa: Algeria, Morocco, Tunisia. Europe: Italy, Spain (Sciaky, 1992; Zaballos and Jeanne, 1994).

***Parophonus hespericus* Jeanne, 1985**

Material examined: Sidi Nsir, 2♂♂, 3♀♀, 11. 04. 2012.

Collection circumstances: These species have been collected under stones and plant debris, mostly in colonization with *P. hispanus* Rambur, 1838

Geographical distribution: North Africa and Italy (Sciaky, 1992); Spain (Jeanne and Zaballos, 1986).

Subtribe Stenolophina Kirby, 1837

Genus *Stenolophus* Dejean, 1821

***Stenolophus (Stenolophus) teutonus* (Schrank, 1781)**

Material examined. Sidi Nsir, 2♂♂, 11. 04. 2012.

Collection circumstances. These species were recorded under stones and debris in a humid place.

Geographical distribution. North Africa: Tunisia; Algeria, Canary Islands, Egypt, Libya, Morocco. Europe: Serbia (Curcic and Stojanovic, 2011), Spain, Malta, Macedonia, Moldova, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, Turkey, Ukraine, Yugoslavia. Asia: Syria, Turkey (Bedel, 1895; Antoine, 1955; Machard, 1997; Löbl and Smetana, 2003).

***Stenolophus (Stenolophus) mixtus* (Herbst, 1784)**

Material examined. Sidi Nsir, 1♂, 4♀♀, 02.05. 2013.

Collection circumstances. Marshy coastal places.

Geographical distribution. North Africa: Algeria, Morocco. Europe: Italy, Spain, Malta, Macedonia, Moldova, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, France, Ukraine (Bedel, 1895; Antoine, 1955; Machard, 1997; Löbl and Smetana, 2003).

Tribe Lebiini Bonelli, 1810

Subtribe Apenina Ball, 1983

Genus *Platytarus* Fairmaire, 1850

***Platytarus bufo* (Fabricius, 1801)**

Material examined: Sidi Nsir, 1♂, 2♀♀, 17. 01. 2013.

Collection circumstances: The species was found under a stone.

Geographical distribution. North Africa: Tunisia, Algeria, Morocco. Europe: Spain, Italy, Portugal (Löbl and Smetana, 2003).

Subtribe Cymindidina Laporte, 1834

Genus *Cymindis* Latreille, 1806

***Cymindis setifensis* Lucas, 1842**

Material examined: Sidi Nsir, 3♀♀, 11. 04. 2012; Ras Injla, 1♂♂, 1♀♀, 13. 06. 2013.

Collection circumstances: The species was found under a small stone.

Geographical distribution: *C. sitifensis* Lucas, 1842 is appropriate to the North of Africa and spread, under diverse forms, in all the Barbary Coast and in the islands Madeira, Salvages and the Canary Islands (Bedel, 1895; Ghannem *et al.,* 2014).

Subtribe Dromiusina Bonelli, 1810

Genus *Apristus* Chaudoir, 1846

***Apristus striatipennis* Lucas, 1846**

Material examined: Ain Draham, 2 ♀♀ 21.03. 2012.

Collection circumstances: Species collected in the gravel, at the edge of running waters.

Geographical distribution: North Africa: Tunisia, Morocco, Algeria, Egypt (Löbl and Smetana, 2003; Machard, 1997). It is an endemic element for West Africa.

Genus *Microlestes* Schmidt-Goebel, 1846

***Microlestes corticalis* (Dufour, 1820)**

Material examined: Ain Draham, 3♂♂, 4♀♀, 08.03.2012; Cap Serrat, 2♂♂, 3♀♀, 18.03.2012.

Collection circumstances: Under dead leaves and plants bass in an argilo-sandy ground.

Geographical distribution: North Africa: Tunisia, Morocco, Algeria, Mauritania, Canary Island, Egypt. Europe: Spain, Italy, France, Germany, Greece, Portugal. Central Asia (Antoine, 1955; Machard, 1997; Löbl and Smetana, 2003).

Subtribe Lebiina Bonelli, 1810

Genus *Lamprias* Bonelli, 1810

***Lamprias fulvicollis* Fabricius, 1792**

Material examined: Cap Serrat, 1♂♂, 4♀♀, 08.03.2012; Ain Draham, 2♂♂, 1♀, 23.05.2012.

Collection circumstances: The species was recolted under the tree of bark.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco. Western Europe (Bedel, 1895; Antoine, 1955; Machard, 1997; Löbl and Smetana, 2003).

Tribe Licinini Bonelli, 1810

Subtribe Licinina Bonelli, 1810

Genus *Licinus* Latreille, 1802

***Licinus punctatulus* Fabricius, 1972**

Material examined: Cap Serrat, 6♂♂, 4♀♀, 14.06. 2012; Ras Injla, 3♂♂, 1♀, 31. 06.2012.

Collection circumstances: These species were collected under stones, pieces of wood and fragments of vegetables, usually in an arid field.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco. Europe: Spain, France: (Antoine, 1955; Machard, 1997; Löbl and Smetana, 2003)

Tribe Platynini Bonelli, 1810

Genus *Olisthopus* Dejean, 1828

***Olisthopus fuscatus* Dejean, 1828**

Material examined: Ain Draham, 1♂, 2♀♀, 26.05.2013.

Collection circumstances: Specimens were collected under stones and fragments of vegetables in a dry ground.

Geographical distribution: North Africa: Tunisia, Algeria, Morocco. Europe: Spain, Italy, Portugal, France (Antoine, 1955; Machard, 1997; Löbl and Smetana, 2003).

Genus *Agonum* Bonelli, 1810

***Agonum* (str.) *nigrum* Dejean, 1828**

Material examined: Ras Injla, 1♂, 3♀♀, 26. 06. 2012; Cap Serrat, 2♂♂, 1♀, 21. 05. 2012.

Collection circumstances: The species was collected under a stone in a marshy ground.

Geographical distribution: North Africa: Tunisia, Morocco. Southern and Western Europe (Antoine, 1955; Machard, 1997; Löbl and Smetana, 2003).

Tribe Pterostichini Bonelli, 1810

Subtribe Pterostichina Bonelli, 1810

Genus *Poecilus* Bonelli, 1810

***Poecilus* (str.) *tyrrhenicus* Csiki, 1930**

Material examined: Sidi Nsir, 2♂♂, 1♀, 22. 05. 2012.

Collection circumstances: The species were collected under stones and fragments of vegetables.

Geographical distribution. North Africa: Tunisia, Morocco, Algeria. Europe: Spain (Andalusia) (Antoine, 1955; Machard, 1997; Löbl and Smetana, 2003).

Genus *Orthomus* Chaudoir, 1838

***Orthomus rubicundus* Coquerel, 1859**

Material examined: Sidi Nsir, 1♂, 2♀♀, 11. 04. 2012.

Collection circumstances: It was found underneath stone surrounded with debris of plants.

Geographical distribution: Endemic for North Africa, mainly found in northern Algeria, northern Tunisia (Mateu, 1954).

Wrong locality: “Sicilia” (Wrase and Jeanne, 2005).

Genus *Percus* Bonelli, 1810

***Percus* (str.) *lineatus* Solier, 1835**

Material examined: Ras Injla, 3♂♂, 2♀♀, 31. 06. 2012; Sidi Nsir,4♂♂, 3♀♀, 11. 04. 2012.

Collection circumstances: They were collected underneath stone and wood.

Geographical distribution: North Africa: Tunisia, Algeria. Europe: Italy (Sicily) (Löbl and Smetana, 2003).

Tribe Sphodrini Laporte, 1834

Subtribe Calathina Laporte, 1834

Genus *Calathus* Bonelli, 1810

***Calathus* (*Bedelinus*) *circumseptus* Germar, 1824**

Material examined: Ain Draham, 2♂♂, 1♀, 4.05. 2012; Ras Injla,2♂♂, 3♀♀, 26. 06. 2012.

Collection circumstances: The specimen was collected under feet of trees, in wet ground.

Geographical distribution: North Africa: Algeria, Morocco. Europe: Albania, Croatia, France, Greece, Italy, Portugal, Spain (Löbl and Smetana, 2003; Serrano *et al.,* 2003).

***Calathus* (*Neocalathus*) *mollis* Marsham, 1802**

Material examined: Ras Injla, 5♂♂, 4♀♀, 26. 06. 2012.

Collection circumstances: They were found underneath feet of tree, in sandy soil.

Geographical distribution: North Africa: Tunisia, Morocco. Europe: Azerbaijan, Armenia, Belgium, Bulgaria, Bosnia Herzegovina, Croatia, Denmark, Estonia, France, Great Britain, Germany, Georgia, Greece, Ireland, Italy, Latvia, Lithuania, Macedonia, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Ukraine, Yugoslavia; Asia: Turkmenistan, Turkey (Bedel, 1895; Antoine, 1955; Machard, 1997; Serrano *et al.,* 2003; Löbl and Smetana, 2003).

Subtribe Sphodrina Laporte, 1834

Genus *Laemostenus* Bonelli, 1810

***Laemostenus* (*Pristonychus*) *algerinus* Gory, 1833**

Material examined: Ras Injla, 2♂♂, 1♀, 26. 06. 2012.

Collection circumstances: The specimen was collected underneath feet of trees.

Geographical distribution: North Africa: Algeria, Morocco, Tunisia. Europe: Croatia, France, Italy, Spain (Bedel, 1895; Antoine, 1955; Machard, 1997; Löbl and Smetana, 2003).

Subtribe Synuchina Lindroth, 1956

Genus *Platyderus* Stephens, 1828

***Platyderus ruficollis* Marshamm, 1802**

Material examined: Sidi Nsir: 2♂♂, 4♀♀, 17.01. 2013.

Collection circumstances. The species were collected under stones and plants.

Geographical distribution: North Africa: Tunisia, Morocco, Algeria. Europe: Western Europe (Bedel, 1895; Antoine, 1955; Machard, 1997)

Tribe Zabrini Bonelli, 1810

Subtribe Amarina Zimmermann, 1832

Genus *Zabrus* Clairville, 1806

******Zabrus (Aulacozabrus) distinctus* Lucas, 1842**

Material examined: Ain Draham, 2♂♂, 3♀♀; 23.04. 2012.

Collection circumstances: Species collected in high places, buried in the sand, and under stones.

Geographical distribution: Endemic to North Africa: Algeria, Morocco (Bedel, 1895; Antoine, 1955; Machard, 1997; Löbl and Smetana, 2003).

Genus *Amara* Bonelli, 1810

***Amara* (str.) *subconvexa* Putzeys, 1865**

Material examined: Ras Injla, 2♂♂, 1♀; 26.06.2012; Ain Draham, 2♂♂, 3♀♀; 23.04. 2012.

Collection circumstances: The specimen was collected by had underneath dead leaves.

Geographical distribution. North Africa: Tunisia, Algeria, Morocco. Europe: Spain, Italy (Sardinia, Sicily), France, Portugal (Bedel, 1895; Antoine, 1955; Machard, 1997; Löbl and Smetana, 2003).

***Amara* (str.) *aenea* Degeer, 1774**

Material examined: RAs Injla, 2♂♂, 3♀♀; 26. 06. 2012; Sidi Nsir, 4♂♂, 2♀♀; 11. 04. 2012; Ain Draham, 3♀♀; 04. 05. 2012.

Collection circumstances:. Species collected underneath pieces of wood, and vegetation debris.

A. aenea De Geer, 1774 present a marked tendency heliophilic and thermophilic which manifested, in both in its preferences in the dry land, exposed to the sun and open, and both for its diurnal behavior (Barndt, 1982; Desender and Alderweireldt, 1990; Kegel, 1990), upon reaching the maximal activity with the maximum temperature.

Geographical distribution. North Africa: Tunisia, Algeria, Egypt, Libya, Morocco. Europe: Belgium, Bosnia Herzegovina, Bulgaria, Croatia, Denmark, France, Great Britain, Germany, Georgia, Greece, Hungary, Ireland, Italy, Luxembourg, Malta, Macedonia, Moldavia, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, Ukraine (Bedel, 1895; Antoine, 1955; Machard, 1997; Löbl and Smetana, 2003). This is a Palearctic element. The species is mentioned in Canada (Spence, 1990).

Tribe Zuphiini Bonelli, 1810

Subtribe Zuphiina Bonelli, 1810

Genus *Zuphium* Latreille, 1806

***Zuphium* (str.) *olens* Rossi, 1790**

Material examined: Sidi Nsir, 1♂, 3♀♀; 04. 05. 2012.

Collection circumstances: The species were collected marshy edge of rivers.

Geographical distribution: North Africa: Tunisia, Morocco, Algeria. Europe: Spain, Italy, Portugal, France, Germany, Greece (Bedel, 1895; Machard, 1997; Löbl and Smetana, 2003).

DISCUSSION

For more than 82 years, Normand (1933) remained the principal source of data on the Tunisian beetle fauna, while progressively becoming outdated. A new, revised and updated list of the carabid species is provided here, recognizing 65 species.

This list does not claim to be complete but provides an updated listing. Further, continuous observations will be necessary to complete the species list. For the 65 species, we found 45 genera, 24 tribes, and nine subfamilies of Carabids from Northern Tunisia. Five species are new records: *Bembidion (Testedium) bipunctatum* (Linne, 1761), *Bembidion (Actedium) kuesteri* Schaum, 1845, *Brachinus (Brachinus) psophia* Serville, 1821, *Stenolophus (Stenolophus) mixtus* (Herbst, 1784) and *Zabrus (Aulacozabrus) distinctus* Lucas, 1842. Additionally, six species endemic to northern Africa: *Siagona rufipes* Fabricius, 1792, *Bembidion (Ocyturanes) praeustum* Dejean, 1831, *Brachinus (Brachynoaptinus) mauretanicus* Bedel, 1914, *Apristus striatipennis* Lucas, 1846, *Orthomus rubicundus* Coquerel, 1859 and *Zabrus (Aulacozabrus) distinctus* Lucas, 1842.

In conclusion, it could be noted that new records increase the strength of carabid fauna of Tunisia. More effort must be made to get more information about the spatio-temporal distribution of carabid species in all ecosystems of the country to help to identify and locate endemic species, rare or endangered species for conservation. We hope that this work will be a basis for future taxonomical and ecological investigations of the Tunisian Carabids.

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