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FOREST BEETLES ASSOCIATED WITH CORK OAK AND *FOMES FOMENTARIUS* FUNGI IN THE COLLO MASSIF (SKIKDA), ALGERIA

GOZDNE VRSTE HROŠČEV, POVEZANE S HRASTOM PLUTOVCEM IN GLIVO *FOMES FOMENTARIUS* V MASIVU COLLO (SKIKDA), ALŽIRIJA

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ABSTRACT

A study conducted in an unburned cork oak forest located in the Collo Massif (Skikda), northwestern Algeria, resulted in the capture of 385 beetles in 2015 and 545 beetles in 2016 at three sub-stations, using Barber pitfall traps. The study lasted three months, from April to June, over two consecutive years. Additionally, using the carpophores method on *Fomes fomentarius* (Linné) (Fries, 1849), a total of 3,017 beetle specimens were obtained in 2015 and 3,107 beetle specimens in 2016, observed over the same three-month period around the three unburned sub-stations (Oued Agouf, Ain Fegoum and El Maktoua). The first observation concerning the Erotylidae family is that they are poorly known in North Africa, including Algeria, where published data on this subject is scarce. This study also revealed the presence of the species *Triplax melanocephala* (Latreille, 1804), which is rarely observed in Algeria. This species was recorded on the tinder fungus *Formes fomentarius*, with 30 individuals and 71 individuals counted in the Barber pitfall traps.

Key words: cork oak forest, Coleoptera, Erotylidae, *Triplax melanocephala,* tinder fungus, *Formes fomentarius*

IZVLEČEK

V študiji, opravljeni v nepogorelem gozdu hrasta plutovca v masivu Collo (Skikda) na severovzhodu Alžirije, je bilo ujetih 385 hroščev leta 2015 in 545 hroščev leta 2016 na treh postajah z uporabo pasti Barber. Študija je potekala tri mesece, od aprila do junija v dveh zaporednih letih. Poleg tega je bilo na trosnjakih *Fomes fomentarius* (Linné) (Fries, 1849) leta 2015 ujetih 3017 primerkov hroščev, leta 2016 pa 3107, in sicer v istem trimesečnem obdobju v okolici treh lokacij nepogorelega gozda (Oued Agouf, Ain Fegoum in El Maktoua). Prva ugotovitev v zvezi z družino Erotylidae je, da je v Severni Afriki, vključno z Alžirijo, slabo poznana. Objavljenih in razpoložljivih podatkov o tem je malo. Ta študija je pokazala tudi pojavljanje vrste *Triplax melanocephala* (Latreille, 1804), ki je v Alžiriji redko opažena. Ta vrsta je bila zabeležena na bukovi kresilki (*Formes fomentarius*) (30 osebkov) in v pasteh Barber (71 osebkov).

Ključne besede: gozd plutovega hrasta, *Triplax melanocephala*, bukova kresilka, *Formes fomentarius*, Coleoptera, Erotylidae

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1 INTRODUCTION
1 UVOD

The Collo Massif (Skikda) forest contains many ancient trees, often lying on the ground or felled by wind. This abundance of deadwood provides a highly favourable environment for the development of lignicolous fungi. The genus *Quercus* (L., 1753), constitutes a very important entomological reservoir (Dajoz, 1980). However, the few studies on beetles in forest environments provide an incomplete picture of the diversity of this group, particularly due to the lack of data on species associated with the *Quercus* genus, especially *Quercus suber* (L., 1753). Deadwood beetles represent around 1,000 species in these environments (Gutowski and Jaroszwicz, 2001) and are considered good bioindicators of forest naturalness.

In Algeria, several studies have inventoried arthropods, including entomofauna in forest environments. Notable works include Fritah (1984) on the cedar forests of Belezma, Benkhelil and Doumandji (1992) on the composition and structure of beetle populations in Babor National Park, Mehenni (1994) on the cedars of Chréa National Park, Ghanem (2014) on cork oak forests in El-Kala National Park, and Daas et al. (2016) on

the beetles of the cork oak forests of Ouled Bechih State forest, Souk Ahras (northeastern Algeria). Despite these studies, this guild of insects remains largely unknown.

Fungal beetles of the Erotylidae family (Cucujoidea) comprise almost 280 genera and 3,200 species worldwide (Lablokoff-Khnzorian, 1975; Lawrence et al., 2000; Wegrzynowicz, 2002). Both larvae and adults feed on the fruiting bodies of macro-basidiomycetes that develop in decaying wood. Most European Erotylidae species are included in the European red list of saproxylic beetles (Nieto and Alexander, 2010). The distribution of Erotylidae in North Africa, particularly Algeria, is poorly understood due to a lack of published faunal data.

Species in the genus *Triplax* (Herbst, 1793) of the Erotylidae family are mycetophagous. Between the mid-1930s and late 1970s, Delkeskamp (1981) conducted intensive work on African Erotylidae, publishing a series of complete revisions (Delkeskamp, 1936; 1954; 1957; 1962; 1965) and a monograph on the fauna of Madagascar by his disciple Phillipp (1965). He also provided a summary of the knowledge of the African fauna in *Coleopterorum Catalogus Supplementum* (Delkeskamp, 1981). North American (Boyle, 1956) and Japanese (Chûjô, 1969) *Erotylids* have also been the subjects of monographs, with recent catalogues published for South and Central America (Alvarenga, 1994) and the Old World excluding Africa and Madagascar (Chûjô and Chûjô, 1988; 1989; 1990).

The genus *Triplax* belongs to the Tritomini tribe within the Erotylidae family and includes 93 species worldwide, with 67 species in the Palaearctic region. These beetles are widely distributed in the Palaearctic, Nearctic and Oriental regions (Goodrich and Skelley, 1997; Wegrzynowicz, 2007; GBIF Secretariat, 2022). They live exclusively on the decomposing fungi of deadwood, classifying them as saproxylic organisms (Alexander, 2008). According to Franc (2001), *Triplax* species are indicators well-preserved forest ecosystems with high biodiversity.

Triplax species are mycetophagous species that live and develop in lignicolous fungi. These beetles are typically found in little-disturbed or unused forests in a good state of conservation, as they depend on the presence of fungi, which are linked to the availability of deadwood. To date, and to the best of our knowledge, *Triplax* species have not been well studied in Algeria, as in the rest of North Africa. For Algeria, the available information is limited to a publication by Chûjô in 1990. *Triplax* larvae appear later and can even grow in dried mushrooms. Pupation usually takes place on the ground, where the older larvae drop off. However, pupae are sometimes found in mushrooms. *Triplax* beetles are nocturnal and are typically observed on old trees and mushrooms.

In Morocco, *Triplax melanocephala* was cited by Chavanon in 2018. This species, previously unknown to Algerian fauna, was recently discovered in the Collo Massif (Skikda). Small, discreet and little known, it has been infrequently observed in Algeria.

Fomes fomentarius is widespread throughout Western Europe, North America, Japan, Central Asia (Courtecuisse and Duhem, 2007), and North and South Africa (Kibby, 2003), including Algeria, Morocco, and Sao Tome and Principe (Gáper and Gáperová, 2014). Tinder fungus is a polypore of the Polyporaceae group of fungi that parasitizes old hardwood trees (Dajoz, 1959).

Several researchers have studied beetle fauna associated with *Fomes fomentarius*, including Benick (1952), Rehfous (1955), Dajoz (1966), Roman (1970), Matthewman and Pielou (1971), Thunes (1994), Jonsell and Nordlander (1995), Økland (1995), Thunes & Willassen (1997), Hågvar and Økland (1997), Hågvar (1999), Fäldt et al. (1999), Jonsell (1999), Jonsell and Norlander (2002), Rukke (2002) and Birkemoe et al. (2018). These authors report the presence of the Erotylidae family with species such as *Dacne bipustulata* (Thunberg, 1781), *Tritoma bipustulata* (Fabricius, 1775), *Triplax aenea* (Schaller, 1783) and *Triplax russica* (L., 1758).

The Erotylidae family includes the species *Triplax melanocephala*. The discovery of *Triplax melanocephala* in the Collo region (Skikda) is significant for Algeria's fauna, as this species has been the subject of limited study. Until now, this small, discreet and little-known insect has rarely been seen in Algeria.

This study, the first conducted in this region, has two main objectives: first, to create a preliminary list of beetles associated with cork oaks, and second, to list the beetles associated with fungi of the genus *Fomes*. The fauna of *Fomes fomentarius* in the Collo Massif (Skikda), particularly on cork oaks, has never been reported in Algeria. We need to complete our understanding of the distribution of saproxylic insects across Algeria's various sub-ecosystems. This study contributes to biodiversity research, aiming to enrich the local inventory and preserve Algeria's national heritage.

2 MATERIALS AND METHODS
2 MATERIALI IN METODE

2.1 Study area
2.1 Območje raziskav

The Collo Massif (37°0′23″ N, 6°33′39″ E), also known as the Kabylie of Collo, is a forested mountain

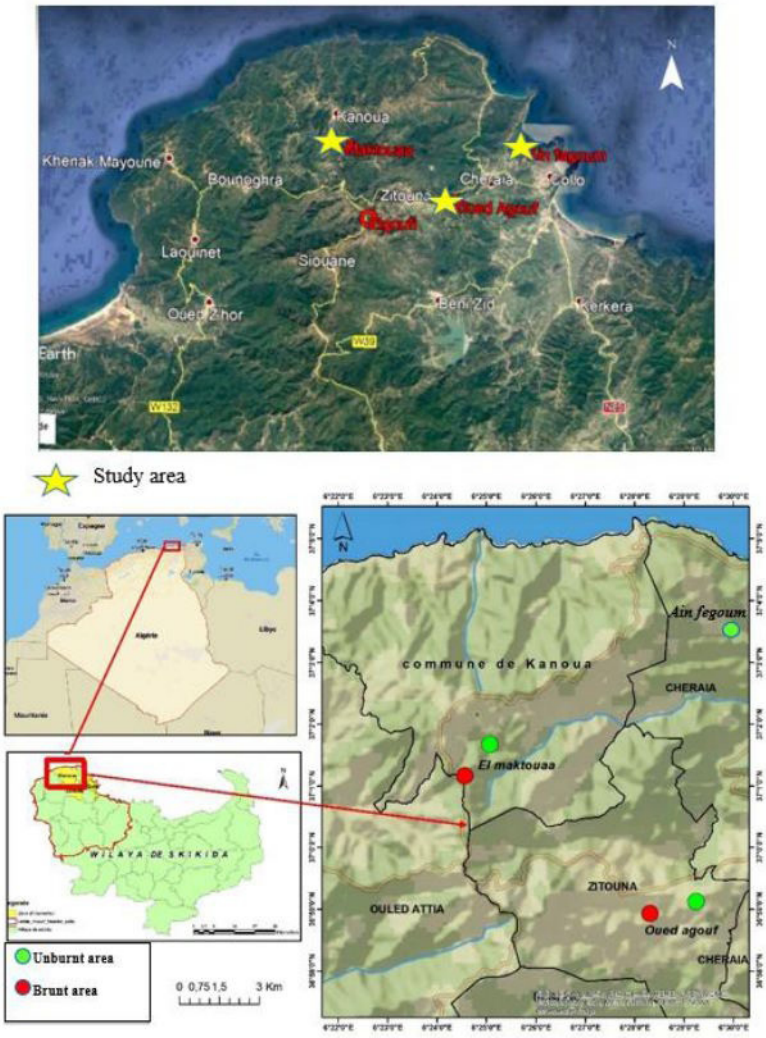

Fig. 1: Location of the study site (Laouira, 2006 (modified))

Slika 1: Lokacija območja raziskav (Laouira, 2006 (prilagojeno))

range in northeastern Algeria, forming part of the Tellian Atlas. It reaches altitudes between 980 and 1,183 m. The region enjoys a humid to subhumid Mediterranean climate, characterized by distinct seasons: a temperate, rainy winter from December to March and a hot, dry summer from June to September (André et al., 2007). It is covered by vast forest formations dominated by cork oak, which provides 30% of the national cork production, alongside Zen oak and maritime pine plantations.

The study area features forest ecosystems with good-quality forest soils that are sufficiently deep, nutrient-rich and resistant to erosion. Noteworthy ecosystems include cork oak forest, alder groves, *Pinus pinaster* (Aiton, 1789) pinewood, and riparian forests, all of which contribute to the region's remarkable biodiversity. Cork oak, the region's dominant climatic species, grows in pure stands and is sometimes associated with Zen oak or *Pinus pinaster.* Other notable species in the area include Afares oak *Quercus afares* (Pomel, 1875), wild cherry *Prunus avium* (L., 1755), narrow-leaved ash *Fraxinus angustifolia* Vahl, European olive *Olea europaea* (L., 1753), and chestnut *Castanea sativa* (Mill.) (Yessad, 2000) (Fig.1).

2.2 Methodology
2.2 Metodologija

We selected three unburned study sites in different locations (Fig.1). Cork is the bark of the cork oak (*Quercus suber*), a semi-evergreen species that is relatively short-lived but resistant to drought and fire (Villemant and Fraval, 2002). More than any other forest species, cork oak supports a highly diverse fauna in its trunk and main branches. Insect and xylophagous fungi attacks on the trunks lead to the formation of cavities where sawdust and decayed wood are gradually transformed into soil by a specialized fauna, which shares many affinities with the litter fauna (Saccardy, 1938). Cork oak is an essential forest species in Algeria, both in terms of its extent and economic importance. It co-

Fig. 2: Tinder fungus *Fomes fomentarius* (a genus of basidiomycete fungi) on an old cork oak in the El Maktoua forest (unburned subarea) and a collection of *Triplax melanocephala* specimens (photo: S. Laouria and F. Marniche, 2016)

Slika 2: Gliva *Fomes fomentarius* (rod gliv prostotrosnice) na starem hrastu plutovcu v gozdu El Maktoua (nepožgano podobmočje) in zbirka primerkov vrste *Triplax melanocephala* (foto: S. Laouria in F. Marniche, 2016)

vers 450,000 ha, including 40,000 ha in Skikda, within the eastern Suberaies (Yessad, 2000).

In this study, we specifically focused on the microenvironment of beetle communities. Two sampling techniques were employed: Barber pitfall traps and the dissection of some polypores (1 and 3 / month) found on cork oaks infected by the tinder fungus *Fomes fomentarius*. Sampling took place over three months (April, May and June) in two successive years (2015 and 2016) at the three study sites: Oued Agouf, Ain Fegoum and El Maktoua (Fig. 1).

Trapping was carried out using interceptor traps or Barber pitfall traps, typically filled with a vinegar attractant (Mathey et al., 1984). Twelve traps per station were set up to be out of sight of shepherds and woodcutters. Traps were randomly placed 1 to 3 meters from the base of the trees. The Barber pitfall traps were buried vertically to create a pit into which walking insects would fall. They were filled to one-third of their capacity with a preservative liquid (vinegar) and a few drops of detergent to act as a wetting agent, preventing insects from crawling back up the walls. To protect the traps from rainwater, a cover (stone, tile or bark) was placed 1 cm above the top edge of the trap.

The traps were set for three months (April, May and June) in two consecutive years (2015 and 2016) at the three study sites: Oued Agouf, Ain Fagoum and El Maktoum. These study areas are unburned forests of dead and old cork oak with the presence of the fungus *Fomes* (Fig. 2). The traps were left in the field for 48 hours, once every two weeks. The contents of the jars were collected in labelled and dated bottles, detailing the location and method of collection. The species captured in the ground traps were then sent to the zoology laboratory of the National Veterinary School of El Alia (Algiers) for identification.

The beetles were recovered with forceps and placed in 70% alcohol. Identification of the beetles was performed using a stereo microscope (Leica MSV266) with an integrated camera (Olympus DP 73) for photography. The identification process was based on dichotomous keys and the works of various authors, including Bedel (1869), Perrier (1937), Nyholm (1953), Antoine (1956), Strand (1965), Lohse (1967), Auber (1971), Coiffait (1972; 1974; 1978; 1982), Dajoz (1985), Du Chatenet (1986), Rogé (1992), Reibnitz (1998; 1999), Rose (2012), Roger et al. (2013), Dodelin (2014), Calmont (2011), and the websites www.kerbtier.de and www.Koleopterologie.de. The Courtecuisse and Duhem (2007) key was used for fungal identification.

2.3 Data analysis
2.3 Analiza podatkov

The results were assessed using several ecological indices. The first was relative abundance (AR%) (Zaime and Gautier, 1989). The second was the Shannon diversity index (H') for diversity (Blondel et al., 1973). It is calculated with the formula $H' = -\sum q_i * \log_2(q_i)$, where H' is the diversity index expressed in bit units and qi is the relative frequency of the species under consideration. Additionally, the equitability index (E) was used to assess how evenly the species were distributed, calculated as the ratio of observed diversity (H') to maximum diversity (H'_{max}) (Blondel, 1979), using the following formula: $E=H'/H'_{max}$. The maximum diversity is represented by the following formula $H'_{max} = \text{Log}_2 S$ where S is the total species richness (Weesie and Belemsobgo, 1997). The recorded data, based on identified beetle catches, were analysed using PAST (PAleontologicalSTatistics) software, Version 2.17 (Hammer et al., 2001).

3 RESULTS
3 REZULTATI

3.1 Taxa richness and diversity
3.1 Vrstna pestrost

3.1.1 Use of Barber pitfall traps
3.1.1 Uporaba pasti Barber

In the three unburned substations studied, 385 individuals of Coleoptera were captured using Barber pitfall traps in 2015, and 545 individuals in 2016. At station 1, Oued Agouf, the number of Coleoptera was 110 individuals (S = 27 species, 13 families) in 2015 and 182 individuals (S = 27 species, 13 families) in 2016. At station 2, Ain Fegoum, 89 individuals (S = 24 species, 16 families) were captured in 2015 and 124 individuals (S = 24 species, 16 families) in 2016. At station 3, El Maktoua, the number of Coleoptera was 186 individuals (S = 27 species, 14 families) in 2015 and 239 individuals (S = 27 species, 14 families) in 2016.

In Oued Agouf, the best-represented family in 2015 was Scarabaeidae, with 34 individuals (AR% = 30.91%), followed by Tenebrionidae, with 29 individuals (AR% = 26.36%). In 2016, the Tenebrionidae family dominated, with 50 individuals (AR% = 27.47%). In Ain Fegoum, the Curculionidae family dominated in 2015 with 14 individuals (AR% = 15.73%), followed by Elateridae with 12 individuals (AR% = 13.48%). In 2016, the Tenebrionidae family dominated with 17 individuals (AR% = 13.71%) followed by Erotylidae with 16 individuals (AR% = 12.90%).

In El Maktoua, the Curculionidae family dominated in 2015 with 42 individuals (AR% = 22.58%), followed by Tenebrionidae (35 individuals, AR% = 18.82%) and Scarabaeidae (29 individuals, AR% = 15.59%). In 2016, Scarabaeidae dominated with 51 individuals (AR% = 21.34%), followed by Tenebrionidae (32 individuals, AR% = 13.39%) and Curculionidae (25 individuals, AR% = 10.46%) (Table 1, Fig. 3).

Regarding the dominant species in the three stations, we note the following:

- In Oued Agouf, the dominant species was *Sisyphus schaefferi* (L., 1758) (31 individuals, AR% = 28.18%) in 2015 and 28 individuals (AR% = 15.38%) in 2016, followed by *Opatrum sabulosum* (L., 1761) with 17 individuals (AR% = 15.45%) in 2015 and 27 individuals (AR% = 14.84%) in 2016.
- In Ain Fegoum, the dominant species in 2015 was *Ampedus nigerrimus* (Lacordaire, Boisduval, Lacordaire, 1835) with 12 individuals (AR% = 13.48%), while in 2016, *Triplax melanocephala* dominated with 16 individuals (AR% = 12.90%).
- In El Maktoua, *Otiorhynchus rugifrons* (Gyllenhal, 1813) was dominant in 2015 with 24 individuals (AR% = 12.90%), while *Sisyphus schaefferi* dominated in 2016 with 37 individuals (AR% = 15.48%).

3.1.2. Shannon diversity index and equitability index
3.1.2 Shannonov indeks pestrosti in indeks enakomernosti

A richness of 21 and 28 species was recorded in the three unburned cork oak forests (Oued Agouf, Ain Fegoum and El Maktoua) over the two years. Shannon diversity index (H') values were similar between the years. In 2015, diversity ranged from 3.75 bits to 4.34 bits, while in 2016, it fluctuated between 4.19 bits and 4.34 bits. This indicates that the Collo Massif has a relatively homogeneous diversity rate, with some specific variation across the three unburned substations sampled. Species equitability (E) values recorded for the Collo Massif over the two years were close to one, showing that the recorded entomofauna is evenly distributed (Table 2).

In the present study, *Triplax melanocephala* was observed in Barber pitfall traps. A total of 71 individuals were recorded, including 25 in 2015 (3 individuals at Oued Agouf, 7 at Ain Fegoum and 15 at El Maktoua) and 46 in 2016 (6 individuals at Oued Agouf, 16 at Ain Fegoum and 24 at El Maktoua). These results are presented in Table 3.

3.1.3 Identification of *Triplax melanocephala*
3.1.3 Določanje vrste *Triplax melanocephala*

Triplax melanocephala has a black head, with the pronotum, antennae and legs being reddish, and the

Table 1: Inventory of Coleoptera species from Barber pitfall traps during three months of study in two consecutive years (2015 and 2016) in the vicinity of three unburned cork forests (Oued Agouf, Ain Fegoum and El Maktoua)

Preglednica 1: Popis vrst reda Coleoptera iz pasti Barber med trimesečno raziskavo v dveh zaporednih letih (2015 in 2016) in v bližini treh nepogorelih gozdov plutovca (Oued Agouf, Ain Fegoum in El Maktoua)

	Sites	Oued Agouf (UCF)				Ain Fegoum (UCF)				El Maktoua (UCF)			
	Year	2015		2016		2015		2016		2015		2016	
Family	Species	ni	AR (%)	ni	AR (%)	ni	AR (%)	ni	AR (%)	ni	AR (%)	ni	AR (%)
Erotylidae*	*Triplax melanocephala**	3	2.73	6	3.30	7	7.87	16	12.90	15	8.06	24	10.04
Coccinellidae	*Scymnus pallipediformis*	0	0	0	0	0	0	0	0	3	1.61	3	1.26
Tenebrionidae	*Opatrum sabulosum*	17	15.45	27	14.84	0	0	0	0	0	0	0	0
	Alphasida (Glabrasida) rugosa	5	4.55	9	4.95	2	2.25	6	4.84	0	0	0	0
	Tentyria interrupta	1	0.91	2	1.10	3	3.37	11	8.87	3	1.61	4	1.67
	Zophosis (Septentriophosis) plana	1	0.91	3	1.65	0	0	0	0	0	0	0	0
	Stenosis laevicollis	2	1.82	5	2.75	0	0	0	0	13	6.99	13	5.44
	Pachychila sp.	3	2.73	4	2.20	0	0	0	0	9	4.84	10	4.18
	Asida sp.	0	0	0	0	0	0	0	0	10	5.38	5	2.09
Latridiidae	*Corticarina fuscula*	0	0	0	0	7	7.87	6	4.84	0	0	0	0
	Enicmus brevicornis	0	0	0	0	2	2.25	5	4.03	0	0	0	0
Mycethophagidae	*Mycetophagus fulvicollis*	0	0	0	0	2	2.25	5	4.03	0	0	0	0
Carabidae	*Microlestes levipennis*	2	1.82	3	1.65	0	0	0	0	0	0	0	0
	Amara fusca	1	0.91	1	0.55	0	0	0	0	4	2.15	5	2.09
	Calathus melanocephalus	1	0.91	2	1.10	0	0	0	0	0	0	0	0
	Calathus rotundicollis	0	0	0	0	4	4.49	4	3.23	0	0	0	0
	Percus lineatus	2	1.82	4	2.20	0	0	0	0	5	2.69	1	0.42
	Abax sp.	2	1.82	3	1.65	0	0	0	0	4	2.15	8	3.35
	Cymindis axillaris	0	0	0	0	0	0	0	0	5	2.69	5	2.09
Chrysomelidae	*Macrolenes dentipes*	0	0	0	0	2	2.25	3	2.42	0	0	0	0
Curculionidae	*Sitona callosus*	2	1.82	5	2.75	0	0	0	0	6	3.23	7	2.93
	Trachyphloeus rectus	2	1.82	3	1.65	0	0	0	0	0	0	0	0
	Hypera variabilis	11	10.00	4	2.20	9	10.11	3	2.42	12	6.45	2	0.84
	Otiorhynchus rugifrons	0	0	0	0	5	5.62	6	4.84	24	12.90	16	6.69
Leiodidae	*Catops rescissicollis*	1	0.91	6	3.30	0	0	0	0	0	0	0	0
	Anisotoma axillaris	0	0	0	0	4	4.49	6	4.84	0	0	0	0
Cisidae	*Cis* sp.	0	0	0	0	8	8.99	8	6.45	0	0	0	0
Anobiidae	*Hadrobregmus fulvicornis*	0	0	0	0	3	3.37	6	4.84	0	0	0	0
Brachyceridae	*Brachycerus undatus*	1	0.91	4	2.20	0	0	0	0	0	0	0	0
Ptinidae	*Ptinus* sp.	9	8.18	19	10.44	5	5.62	12	9.68	9	4.84	8	3.35
Histeridae	*Saprinus caerulescens*	2	1.82	6	3.30	0	0	0	0	3	1.61	7	2.93
	Saprinus immundus	2	1.82	6	3.30	0	0	0	0	0	0	0	0
Dermestidae	*Dermestes frischii*	3	2.73	8	4.40	0	0	0	0	5	2.69	7	2.93
Elateridae	*Melanotus* sp.	1	0.91	2	1.10	0	0	0	0	0	0	0	0
	Ampedus nigerrimus	0	0	0	0	12	13.48	6	4.84	0	0	0	0
	Agriotes obscurus	0	0	0	0	0	0	0	0	3	1.61	6	2.51
	Cebrio gigas	0	0	0	0	0	0	0	0	2	1.08	3	1.26
Staphylinidae	*Xantholinus media*	1	0.91	2	1.10	0	0	0	0	1	0.54	3	1.26
	Atheta crassicornis	0	0	0	0	5	5.62	7	5.65	9	4.84	12	5.02
Lampyridae	*Lampyris noctiluca*	0	0	0	0	0	0	0	0	4	2.15	2	0.84
Geotrupidae	*Trypocopris vernalis*	1	0.91	6	3.30	2	2.25	2	1.61	1	0.54	15	6.28
Scarabaeidae	*Copris hispanus*	2	1.82	13	7.14	0	0	0	0	6	3.23	6	2.51
	Rhizotrogus pallidipennis	1	0.91	1	0.55	1	1.12	2	1.61	3	1.61	8	3.35
	Sisyphus schaefferi	31	28.18	28	15.38	2	2.25	5	4.03	20	10.75	37	15.48
Trogidae	*Trox fabricii*	0	0	0	0	4	4.49	5	4.03	5	2.69	14	5.86
Cetonidae	*Protaetia opaca*	0	0	0	0	0	0	0	0	2	1.08	8	3.35
S = 21 family	**S = 47 species**	**110**	**100.00**	**182**	**100.00**	**89**	**100.00**	**124**	**100.00**	**186**	**100.00**	**239**	**100.00**

S: total richness; ni: number of the individuals; AR%: Relative abundance in %; *: first reported; UCF: unburned cork forests

rest of the body black. The antennae are shorter, with narrower articles. The tibiae are greatly enlarged at the tip, especially the anterior ones. The beetle measures 3.5 to 4.8 mm, with the metatibia less dilated (Merkl, 2004; Hackston, 2009; Ruta et al., 2011; Dodelin and Saurat, 2014) (Fig.4). Compared to other species of Triplax and based on the key adapted by Mike Hackston from Joy (1932), it is a rare, small Erotylidae beetle, found on the carpophores of trees. The adults are primarily nocturnal and active on polypores, with larvae developing in the same fungi. The species is found in Central and Southern Europe (Calmont, 2011). In Morocco, Kocher confirmed Triplax melanocephala at Guenfouda (Chavanon, 2018).

According to Dajoz (1989), *Triplax* is easily recognizable by several morphological characteristics: its size ranges from 3 to 6.5 mm, it has an elongated oval shape, and its integument is glabrous, smooth and shiny. The elytra are usually black, sometimes blue or green. The head is black or red, and the pronotum is uniformly reddish in European, North African, and North American species. The last article of the maxillary palps is greatly enlarged, crescent-shaped or semicircular. The tarsi has five articles, with the fourth being small. The elytra feature a well-marked basal margin formed by a line of depressed dots.

Synonyms of this species, according to Wegrzynowicz (2004), include *Triplax ruficollis* (Stephens, 1830) (species CD_NOM = 403608), *Tritoma collaris* (Fabricius, 1801) (species CD_NOM = 403606), *Tritoma melanocephala* (Latreille, 1804) (species CD_NOM = 801762), *Triplax nigriceps* (Lacordaire, 1842) (species CD_NOM = 403607), *Platichna collaris*, *Platichna melanocephala*, *Platichna nigriceps*, *Platichna ruficollis*, *Triplax cyanescens* (Bedel, 1868) = *Tiplax melanocephala.*

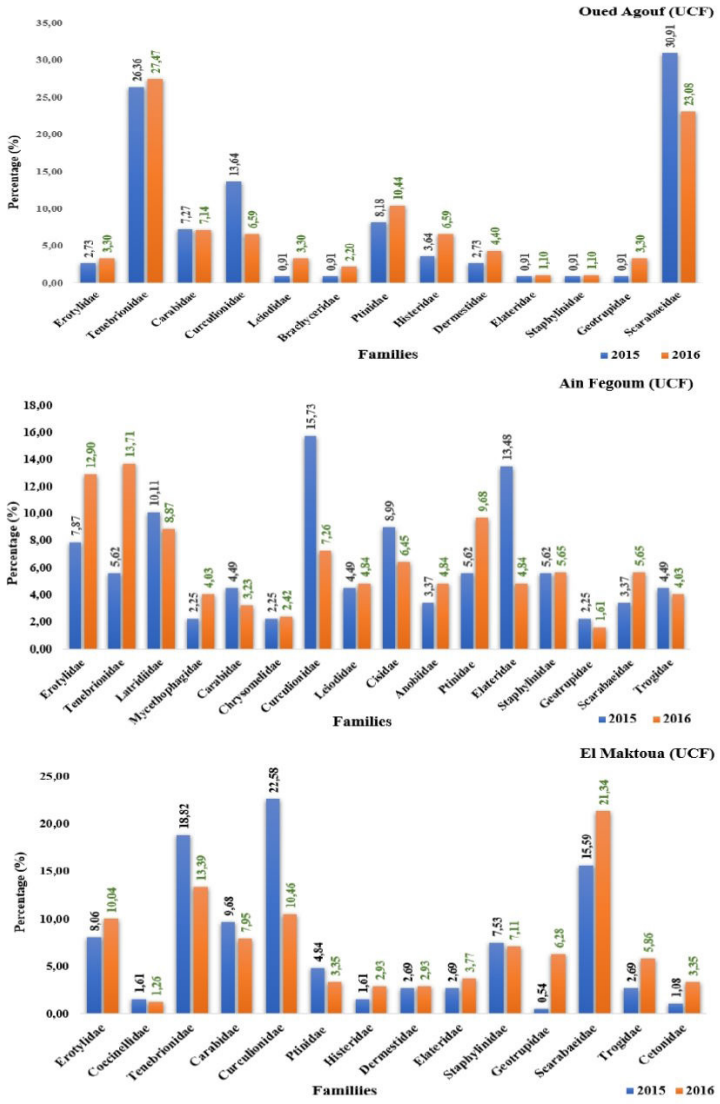

Fig. 3: Relative importance of various beetle families in the three study sites during 2015 and 2016 (UCF: unburned cork oak)

Slika 3: Relativna pomembnost različnih družin hroščev na treh študijskih lokacijah v letih 2015 in 2016 (UCF: nepogorel hrast plutovec)

Table 2: Ecological indices of species trapped in Barber pitfall traps during the two-year study in the unburned cork forests of the Collo Massif

Preglednica 2: Ekološki indeksi vrst, ujetih v pasteh Barber med dvoletno raziskavo na območju nepogorelih gozdov plutovca v masivu Collo

Site	Oued_Agouf_(UCF)		Ain_Fegoum_(UCF)		El_Maktoua_(UCF)	
year	2015	2016	2015	2016	2015	2016
Taxa_S	28	28	21	21	28	28
Individuals	110	182	89	124	186	239
Dominance_D	0.90	0.84	0.92	0.89	0.84	0.80
Shannon_H' (bits)	3.75	4.19	4.06	4.13	4.34	4.34
Simpson_1-D	0.10	0.16	0.08	0.11	0.16	0.20
Evenness_e^H/S	0.05	0.06	0.06	0.07	0.06	0.07
H'_{max}. (bits)	4.81	4.81	4.39	4.39	4.81	4.81
Equitability_E	0.78	0.87	0.92	0.94	0.90	0.90

UCF: unburned cork forests; S: total richness; H': Shannon diversity index; H'_{max}: maximum diversity; E: equitability index

3.1.4 Results of dissections of the tinder fungus *(Fomes fomentarius)*

3.1.4 Rezultati pregleda trosnjakov bukove kresilke (*Fomes fomentarius*)

The tinder fungus (*Fomes fomentarius)* is abundant on dead cork oaks and is probably the most common mushroom in the forest. During three months of study in two consecutive years (2015 and 2016), 3,017 beetle specimens were obtained from *Fomes fomentarius* in 2015, and 3,107 beetle specimens were observed in 2016. The study was conducted around three unburned areas (Oued Agouf, Ain Fegoum and El Maktoua). A total of 33 families of beetles and 86 species were recorded. These results are presented in Table 4, Fig. 5. The highest number of beetle species was recorded in the families Latrediidae, Staphylinidae, Scarabaeidae and Cryptophagidae.

We noted that at station 1, Oued Agouf, the number of Coleoptera was 719 individuals (S = 62 species, 29 families) in 2015 and 670 individuals (S = 61 species, 27 families) in 2016. At station 2, Ain Fegoum, the number of Coleoptera was 984 individuals (S = 56 species, 28 families) in 2015 and 975 individuals (S = 62 species, 25 families) in 2016. At the third station, El Maktoua, the number of Coleoptera was 1,314 individuals (S = 66 species, 28 families) in 2015 and 1,462 individuals (S = 67 species, 29 families) in 2016.

The best-represented family in 2015 was Staphylinidae, with 196 individuals (AR% = 27.26%), followed by Latridiidae (146 individuals, AR% = 20.31%) and Scarabaeidae (111 individuals, AR% = 15.44%). The other Coleoptera families were poorly represented, with numbers ranging from 1 to 85 individuals (0.14% ≥ AR% ≥ 11.82%) in Oued Agouf. In 2016, the Staphylinidae family (166 individuals, AR% = 24.78%) was in first position. In Ain Fegoum, the Scarabaeidae family dominated in 2015 with 401 individuals (AR% = 40.75%), followed by Staphylinidae with 174 individuals (AR% = 17.68%). In 2016, Scarabaeidae again dominated with 314 individuals (AR% = 32.21%), followed by Staphylinidae with 180 individuals (AR% = 18.46%). Other Coleoptera families were poorly represented, with 1 to 67 individuals (0.10% ≥ AR% ≥ 6.56%).

At El Maktoua at the end of 2015, the Scarabaeidae family dominated with an AR% of 51.29 % (674 individuals), followed by Staphylinidae (142 individu-

Table 3: Observed presence of *Triplax melanocephala* in different environments (unburned cork forests) of the Collo Massif (Skikda) during the two study years (2015 and 2016)

Preglednica 3: Opaženo pojavljanje *Triplax melanocephala* v različnih okoljih (nepogoreli gozdovi plutovca) masiva Collo (Skikda) v dveh letih (2015 in 2016) raziskave

Species	*Triplax melanocephala*											
Site	Oued Agouf (unburned cork forests)				Ain Fegoum (unburned cork forests)				El Maktoua (unburned cork forests)			
Year	2015		2016		2015		2016		2015		2016	
Parameters / month	ni	AR (%)	ni	AR (%)	ni	AR (%)	ni	AR (%)	ni	AR (%)	ni	AR (%)
April	2	66.67	3	50.00	4	57.14	7	43.75	4	26.667	6	25.00
May	1	33.33	2	33.33	1	14.29	5	31.25	5	33.333	8	33.33
June	0	0.00	1	16.67	2	28.57	4	25.00	6	40.000	10	41.67
Total (N)	3	100.00	6	100.00	7	100.00	16	100.00	15	100.000	24	100.00

ni: number of individuals; AR (%): relative abundance in %

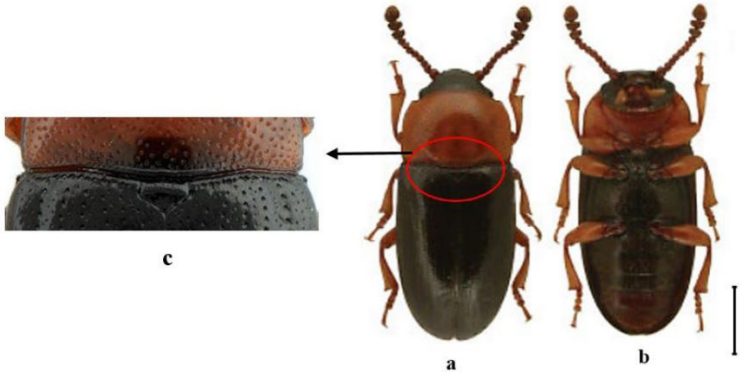

Fig. 4: *Triplax melanocephala* (Coleoptera – Erotylidae); a: habitus dorsal, b: habitus ventral, c: basal part of elytra Bras – 1.0 mm (photo: F. Marniche, 2016)

Slika 4: *Triplax melanocephala* (Coleoptera – Erotylidae); a: habitus dorzalno, b: habitus ventralno, c: bazalni del elitre Bras – 1,0 mm (foto: F. Marniche, 2016)

als, AR% = 10.81%) and Latridiidae (128 individuals, AR% = 9.74%). In 2016, Scarabaeidae continued to dominate with an AR% of 42.07% (615 individuals), followed by the Staphylinidae (218 individuals, AR% = 14.91%) and the Crytophagidae (166 individuals, AR% = 11.35%). Other beetle families were poorly represented, with 1 to 98 individuals (0.07% ≥ AR% ≥ 6.70%) (Table 4, Fig. 5).

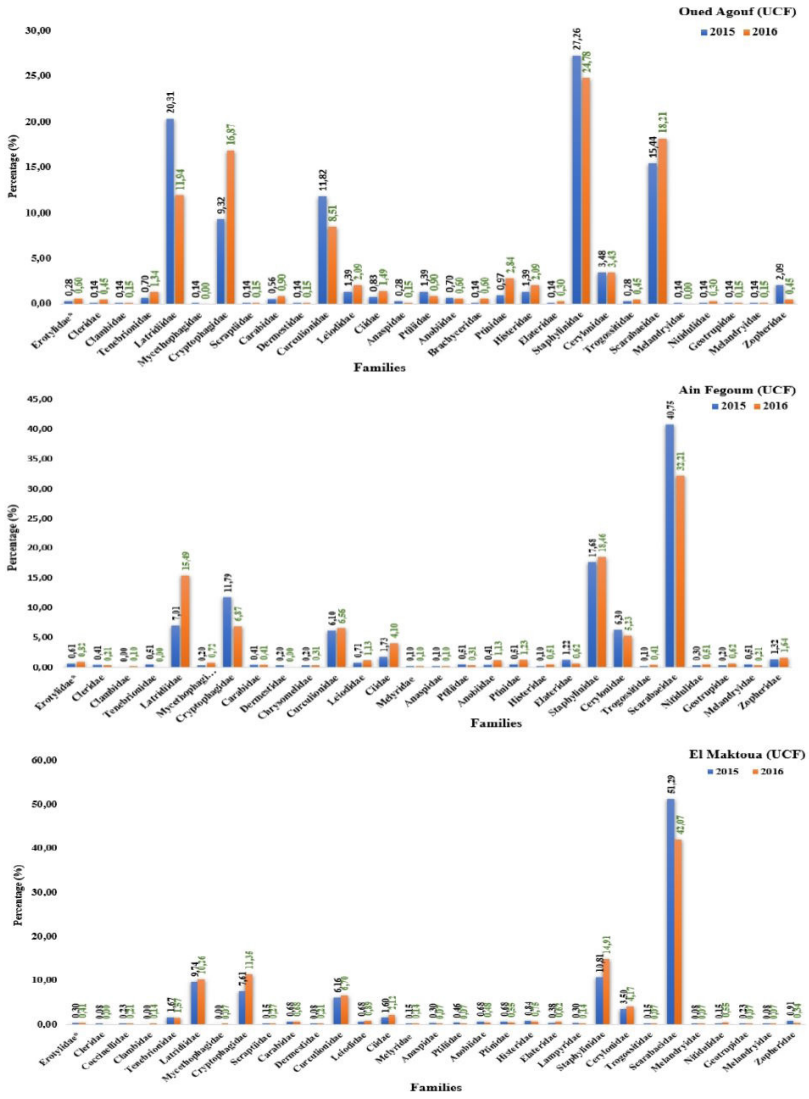

Fig. 5: Relative importance of various beetle families found in *Fomes* mushrooms at three study sites during 2015 and 2016 (UCF: unburned cork oak)

Slika 5: Relativna pomembnost različnih družin hroščev, najdenih v trosnjakih glive *Fomes* na treh raziskovalnih lokacijah v letih 2015 in 2016 (UCF: nepogorel gozd plutovca)

Table 4: Inventory of Coleoptera species on the tinder fungus (*Fomes fomentarius*) during three months of study in two consecutive years (2015 and 2016) in the vicinity of three unburned cork forests (Oued Agouf, Ain fegoum and El Maktoua)

Preglednica 4: Popis vrst reda Coleoptera na bukovi kresilki (*Fomes fomentarius*) med trimesečno raziskavo v dveh zaporednih letih (2015 in 2016) v bližini treh nepogorelih gozdov plutovca (Oued Agouf, Ain fegoum in El Makto

	Site	Oued Agouf (UCF)				Ain Fegoum (UCF)				El Maktoua (UCF)			
	Year	2015		2016		2015		2016		2015		2016	
Family	Species	ni	AR (%)	ni	AR (%)	ni	AR (%)	ni	AR (%)	ni	AR (%)	ni	AR (%)
Erotylidae*	*Triplax melanocephala**	2	0.28	4	0.60	6	0.61	8	0.82	4	0.30	6	0.41
Cleridae	*Tillus elongatus*	1	0.14	3	0.45	4	0.41	2	0.21	1	0.08	0	0.00
Coccinellidae	*Scymnus pallipediformis*	0	0.00	0	0.00	0	0.00	0	0.00	3	0.23	3	0.21
Clambidae	*Clambus punctulum*	1	0.14	1	0.15	0	0.00	1	0.10	0	0.00	2	0.14
Tenebrionidae	*Stenosis laevicollis*	2	0.28	5	0.75	0	0.00	0	0.00	13	0.99	13	0.89
	Bolitophagus reticulatus **	3	0.42	4	0.60	5	0.51	0	0.00	9	0.68	10	0.68
Latridiidae	*Corticarina fuscula*	0	0.00	0	0.00	7	0.71	6	0.62	0	0.00	0	0.00
	Enicmus brevicornis	0	0.00	0	0.00	2	0.20	5	0.51	0	0.00	0	0.00
	Corticaria longicollis	1	0.14	2	0.30	1	0.10	1	0.10	1	0.08	1	0.07
	Cartodere nodifer	145	20.17	78	11.64	59	6.00	139	14.26	127	9.67	149	10.19
Mycethophagidae	*Mycetophagus fulvicollis*	0	0.00	0	0.00	2	0.20	5	0.51	0	0.00	0	0.00
	Litargus connexus	1	0.14	0	0.00	0	0.00	2	0.21	0	0.00	1	0.07
Cryptophagidae	*Atomaria alpina*	1	0.14	1	0.15	2	0.20	1	0.10	2	0.15	1	0.07
	Cryptophagus schmidti	0	0.00	2	0.30	1	0.10	1	0.10	3	0.23	1	0.07
	Cryptophagus dentatus	66	9.18	110	16.42	113	11.48	65	6.67	95	7.23	164	11.22
Scraptiidae	*Anaspis rufilabris*	1	0.14	1	0.15	0	0.00	0	0.00	2	0.15	4	0.27
Carabidae	*Microlestes levipennis*	2	0.28	3	0.45	0	0.00	0	0.00	0	0.00	0	0.00
	Amara fusca	1	0.14	1	0.15	0	0.00	0	0.00	4	0.30	5	0.34
	Trichochlaenius chrysocephalus	1	0.14	2	0.30	0	0.00	0	0.00	0	0.00	0	0.00
	Calathus rotundicollis	0	0.00	0	0.00	4	0.41	4	0.41	0	0.00	0	0.00
	Cymindis axillaris	0	0.00	0	0.00	0	0.00	0	0.00	5	0.38	5	0.34
Dermestidae	*Megatoma undata*	1	0.14	1	0.15	2	0.20	0	0.00	1	0.08	3	0.21
Chrysomelidae	*Macrolenes dentipes*	0	0.00	0	0.00	2	0.20	3	0.31	0	0.00	0	0.00
Curculionidae	*Sitona callosus*	2	0.28	5	0.75	0	0.00	0	0.00	6	0.46	7	0.48
	Trachyphloeus rectus	2	0.28	3	0.45	0	0.00	0	0.00	0	0.00	0	0.00
	Hypera variabilis	2	0.28	4	0.60	9	0.91	3	0.31	12	0.91	2	0.14
	Orchestes fagi	3	0.42	2	0.30	1	0.10	1	0.10	5	0.38	6	0.41
	Otiorhynchus rugifrons	0	0.00	0	0.00	5	0.51	6	0.62	24	1.83	16	1.09
	Cotaster cuneipennis	76	10.57	43	6.42	45	4.57	54	5.54	34	2.59	67	4.58
Leiodidae	*Catops rescissicollis*	1	0.14	6	0.90	0	0.00	0	0.00	0	0.00	0	0.00
	Choleva sp.	0	0.00	0	0.00	4	0.41	6	0.62	0	0.00	0	0.00
	Agathidium seminulum	1	0.14	0	0.00	0	0.00	3	0.31	1	0.08	2	0.14
	Anisotoma humeralis	8	1.11	7	1.04	3	0.30	2	0.21	7	0.53	10	0.68
	Nargus algiricus	0	0.00	1	0.15	0	0.00	0	0.00	1	0.08	1	0.07
Ciidae	*Cis* sp.	0	0.00	1	0.15	8	0.81	8	0.82	1	0.08	1	0.07
	Cis fagi	2	0.28	5	0.75	4	0.41	6	0.62	11	0.84	7	0.48
	Cis castaneus	1	0.14	1	0.15	2	0.20	2	0.21	3	0.23	5	0.34
	Cis jacquemarti	1	0.14	1	0.15	1	0.10	4	0.41	1	0.08	2	0.14
	Sulcacis affinis	1	0.14	2	0.30	1	0.10	2	0.21	4	0.30	3	0.21
	Aspidiphorus orbiculatus	1	0.14	0	0.00	0	0.00	6	0.62	1	0.08	7	0.48
	Rhopalodontus perforatus	0	0.00	0	0.00	1	0.10	12	1.23	0	0.00	6	0.41
Melyridae	*Haplocnemus impressus*	0	0.00	0	0.00	1	0.10	1	0.10	2	0.15	2	0.14
Anaspidae	*Anaspis arctica*	2	0.28	1	0.15	1	0.10	1	0.10	4	0.30	1	0.07
Ptiliidae	*Ptenidium formicetorum*	1	0.14	0	0.00	1	0.10	1	0.10	1	0.08	0	0.00
	Pteryx suturalis	0	0.00	1	0.15	1	0.10	0	0.00	0	0.00	0	0.00
	Acrotrichis intermedia	9	1.25	5	0.75	3	0.30	2	0.21	5	0.38	1	0.07
Anobiidae	*Hadrobregmus fulvicornis*	0	0.00	1	0.15	3	0.30	6	0.62	0	0.00	0	0.00
	Anobiidae sp.	2	0.28	1	0.15	1	0.10	3	0.31	3	0.23	2	0.14
	Ptilinus pectinicornis	2	0.28	2	0.30	0	0.00	1	0.10	3	0.23	4	0.27
	Ptinus subpilosus	1	0.14	0	0.00	0	0.00	1	0.10	3	0.23	1	0.07

Brachyceridae	*Brachycerus undatus*	1	0.14	4	0.60	0	0.00	0	0.00	0	0.00	0	0.00
Ptinidae	*Ptinus* sp.	7	0.97	19	2.84	5	0.51	12	1.23	9	0.68	8	0.55
Histeridae	*Saprinus caerulescens*	2	0.28	6	0.90	0	0.00	0	0.00	3	0.23	7	0.48
	Saprinus immundus	2	0.28	6	0.90	0	0.00	0	0.00	0	0.00	0	0.00
	Paromalus parallelepipedus	1	0.14	2	0.30	0	0.00	1	0.10	2	0.15	1	0.07
	Gnathoncus nannetensis	1	0.14	0	0.00	0	0.00	0	0.00	2	0.15	1	0.07
	Abraeus granulum	4	0.56	0	0.00	1	0.10	4	0.41	4	0.30	2	0.14
Elateridae	*Melanotus* sp.	1	0.14	2	0.30	0	0.00	0	0.00	0	0.00	0	0.00
	Ampedus nigerrimus	0	0.00	0	0.00	12	1.22	6	0.62	0	0.00	0	0.00
	Agriotes obscurus	0	0.00	0	0.00	0	0.00	0	0.00	3	0.23	6	0.41
	Athous bicolor	0	0.00	0	0.00	0	0.00	0	0.00	2	0.15	3	0.21
Lampyridae	*Lampyris noctiluca*	0	0.00	0	0.00	0	0.00	0	0.00	4	0.30	2	0.14
Staphylinidae	*Xantholinus media*	1	0.14	2	0.30	0	0.00	0	0.00	1	0.08	3	0.21
	Atheta crassicornis	0	0.00	0	0.00	5	0.51	7	0.72	9	0.68	12	0.82
	Xylodromus concinnus	1	0.14	1	0.15	1	0.10	3	0.31	2	0.15	4	0.27
	Atheta (Alaobia) pallidicornis	0	0.00	1	0.15	2	0.20	0	0.00	1	0.08	5	0.34
	Leptusa ruficollis	114	15.86	112	16.72	115	11.69	96	9.85	45	3.42	119	8.14
	Gyrophaena nana	1	0.14	1	0.15	2	0.20	2	0.21	1	0.08	1	0.07
	Proteinus brachypterus	0	0.00	2	0.30	4	0.41	2	0.21	5	0.38	7	0.48
	Bolitochara lucida	2	0.28	3	0.45	1	0.10	2	0.21	2	0.15	8	0.55
	Aleochara sparsa	6	0.83	4	0.60	0	0.00	2	0.21	5	0.38	4	0.27
	Quedius xanthopus	32	4.45	13	1.94	17	1.73	27	2.77	30	2.28	9	0.62
	Lathrobium fulvipenne	1	0.14	4	0.60	2	0.20	1	0.10	2	0.15	2	0.14
	Aleocharinae sp.	2	0.28	1	0.15	1	0.10	1	0.10	1	0.08	1	0.07
	Omalium rugatum	1	0.14	0	0.00	0	0.00	0	0.00	2	0.15	4	0.27
	Acrulia inflata	14	1.95	13	1.94	16	1.63	18	1.85	20	1.52	30	2.05
	Phyllodrepa melanocephala	21	2.92	9	1.34	8	0.81	19	1.95	16	1.22	9	0.62
Cerylonidae	*Cerylon ferrugineum*	25	3.48	23	3.43	62	6.30	51	5.23	46	3.50	61	4.17
Trogossitidae	*Thymalus limbatus*	2	0.28	3	0.45	1	0.10	4	0.41	2	0.15	1	0.07
Monotomidae	*Rhizophagus* sp.	1	0.14	10	1.49	12	1.22	7	0.72	6	0.46	11	0.75
	Rhizophagus dispar	110	15.30	112	16.72	389	39.53	307	31.49	668	50.84	604	41.31
Nitidulidae	*Pocadius ferrugineus*	1	0.14	2	0.30	3	0.30	5	0.51	2	0.15	8	0.55
Geotrupidae	*Trypocopris vernalis*	1	0.14	1	0.15	2	0.20	6	0.62	3	0.23	1	0.07
Melandryidae	*Orchesia undulata*	1	0.14	1	0.15	5	0.51	2	0.21	1	0.08	1	0.07
Zopheridae	*Coxelus pictus*	15	2.09	3	0.45	13	1.32	16	1.64	12	0.91	5	0.34
S = 33 families	**S = 86 species**	**719**	**100.00**	**670**	**100.00**	**984**	**100.00**	**975**	**100.00**	**1314**	**100.00**	**1462**	**100.00**

*First record, **exclusive species of *Fomes fomentarius;* UCF: unburned cork forests; ni: number of individuals; AR (%): relative abundance in %

Concerning the dominant species in these three stations, we note the following:

- At Oued Agouf, the dominant species in 2015 was *Cartodere nodifer* (Westwood, 1839), with 145 individuals (AR% = 20.17%). In 2016, two species dominated, *Leptusa ruficollis* (Erichson, 1839) and *Rhizophagus dispar* (Paykull, 1800), both with 112 individuals (AR% = 16.72%), followed by *Leptusa ruficollis* with 114 individuals (AR% = 15.86%) in 2015 and *Cryptophagus dentatus* (Herbst, 1793) with 110 individuals (AR% = 16.42%) in 2016.
- At Ain Fegoum, the dominant species in 2015 was *Rhizophagus dispar*, with 389 individuals (AR% = 39.53%) and in 2016, *Leptusa ruficollis* with 115 individuals (AR% = 11.69%).
- At El Maktoua, the dominant species in 2015 was *Rhizophagus dispar*, with 668 individuals (AR% = 50.84%), and in 2016, *Cartodere nodifer* dominated with 127 individuals (AR% = 9.67%).

During the dissection of tinder fungi, we noted the presence of *Triplax melanocephala*. In this study, *Triplax melanocephala* was only observed on dead cork oaks with *Fomes* fungi. A total of 30 individuals were recorded: 12 individuals in 2015 (2 individuals at Oued Agouf, 6 individuals at Ain Fegoum and 4 individuals at El Maktoua) and 18 individuals in 2016 (4 individuals at Oued Agouf, 8 individuals at Ain Fegoum and 6 individuals at El Maktoua) (Table 5).

4 DISCUSSION AND CONCLUSIONS
4 RAZPRAVA IN ZAKLJUČKI

The first method (Barber pitfall traps) captured 385 beetle individuals in 2015 and 545 in 2016. The

Table 5: Observed presence of the species *Triplax melanocephala* in *Fomes* mushrooms from various environments (unburned cork forests) of the Collo Massif (Skikda) during the two-year study period (2015 and 2016)

Preglednica 5: Opažena prisotnost vrste *Triplax melanocephala* v trosnjakih gliv *Fomes* iz različnih okolij (nepogoreli gozdovi plutovca) masiva Collo (Skikda) v dvoletnem obdobju raziskav (2015 in 2016)

Species	*Triplax melanocephala*											
Site	Oued Agouf (unburned cork forests)				Ain Fegoum (unburned cork forests)				El Maktoua (unburned cork forests)			
Year	2015		2016		2015		2016		2015		2016	
Parameters / month	ni	AR (%)	ni	AR (%)	ni	AR (%)	ni	AR (%)	ni	AR (%)	ni	AR (%)
April	1	50.00	2	50.00	3	50.00	1	12.50	1	25.00	0	0.00
May	0	0.00	1	25.00	2	33.33	2	25.00	2	50.00	5	83.33
June	1	50.00	1	25.00	1	16.67	5	62.50	1	25.00	1	16.67
Total (N)	2	100.00	4	100.00	6	100.00	8	100.00	4	100.00	6	100.00

ni: number of individuals; AR (%): relative abundance in %

most represented family was Scarabaeidae, followed by Tenebrionidae and Curculionidae. During the two years of the study, the dominant species varied from station to station. These included *Sisyphus schaefferi* (14.84% ≥ AR% ≥ 28.18%) in 2015 and 2016 at the Oued Agouf site (unburned cork forests), *Ampedus nigerrimus* (AR% = 13.48%) in 2015 and *Triplax melanocephala* (AR% = 12.90%) in 2016 at Ain Fegoum (unburned cork forests), and *Otiorhynchus rugifrons* (AR% = 12.90%) in 2015 and *Sisyphus schaefferi* (AR% = 15.48%) in 2016 at El Maktoua (unburned cork forests). In contrast, the second method, which involved dissecting the tinder fungus *Fomes fomentarius* polypores, yielded 3,017 beetle specimens in 2015 and 3,107 in 2016. The most beetle species were recorded in the families Latridiidae, Staphylinidae, Scarabaeidae and Cryptophagidae. The dominant species varied across stations during the two study years. At Oued Agouf (unburned cork forests), *Cartodere nodifer* exhibited the highest relative abundance (AR% = 20.17%) in 2015, while in 2016, *Leptusa ruficollis* and *Rhizophagus dispar* predominated (AR% = 16.72%). At both Ain Fegoum (unburned cork forests) and El Maktoua (unburned cork forests), *Rhizophagus dispar* was the most abundant species, comprising 31.49% and 50.84% of relative abundance in 2015 and 2016, respectively.

In this study, we also noted the presence of *Triplax melanocephala* in both sampling methods. In Algeria, global studies on forest beetles have only been carried out on a limited number of plant formation species (Mehenni, 1994; Meziane, 2017). Research remains insufficient and incomplete, particularly in cork oak forests. The lack of data on species associated with the genus *Quercus*, in particular *Quercus suber*, and the fact that most work on forest beetles has been carried out in habitats other than oak, present an incomplete picture of the diversity of this group. Cork oak forests are highly heterogeneous, forming a mosaic of habitats with a significant shrub layer, dense or clear scrub, fallow land and grasslands. This diverse landscape architecture offers numerous opportunities for the establishment of a rich entomofauna.

The richness and abundance of certain families, such as Carabidae, can be very high in the most degraded environments, according to Brin and Brustel (2006) and Silva et al. (2008). Several taxa are considered good bioindicators of the ecological quality and conservation status of forest environments (Tamisier et al., 2006). The carabid beetle species found in the Collo massif are predators, feeding on the larvae of various insects, including wood-eating insects. Decomposer insects play an important role in the decomposition of dead plant material. Similar decomposer insects were present in the three studied cork oak stands. Overall, the species composition of the Coleoptera fauna collected was relatively high compared to the results of other studies, such as the M'Sila subarea in northwestern Algeria, where 34 species were recorded (Bouchaour-Djabeur, 2013) and Ouled Bechih (Souk Ahras), where 41 species were recorded (Saighi, 2013). In the Tlemcen region (western Algeria), Nichane et al. (2013) collected 30 species of Coleoptera, while Daas et al. (2016) recorded a higher number (68 species) in the subalpine forest of El Kala National Park.

This study highlights the importance of the microhabitat provided by the host tree and confirms the wide diversity of beetle species that visit the sporophores of *Fomes fomentarius*. We also noted the presence of the Ciidae family at all three study sites; these small beetles feed on wood, fungi, moulds and other decaying organic matter. Some species, such as *Cis lineatocribratus* (Mellié, 1848), *Rhopalodontus perforatus* (Gyllenhal, 1813) and *Cis jacquemarti* (Mellié, 1849) (Ciidae), are oligophagous and nearly exclusive to *Fomes fomentar-*

ius (Økland, 1995; Orledge and Reynolds, 2005). Mycophagous beetles tend to be more specialized when living on a perennial substrate such as Polyporaceae, whereas species associated with ephemeral substrates such as Agaricales need to be more polyphagous (Dajoz, 1998; Hanski, 1989).

Our results are similar to those obtained by Matthewman and Pielou (1971) in Gatineau Park, Canada, where nearly 2,000 adult individuals representing 25 families and at least 46 species were recorded on 498 of the 1,448 sporophores examined. Thunes (1994) found that the fauna was strongly dominated by just three families: Ciidae, Staphylinidae and Latridiidae (accounting for 94% of individuals and 76% of species). This is consistent with the results obtained by Klimaszewski and Peck (1986), who noted that the Staphylinidae family, with 16 species, was most represented. This very hard fungus is often little attacked. However, older specimens, dried out and mostly fallen to the ground, were found to be completely invaded by the larvae and adults of the Tenebrionid *Boletophagus reticulatus*, reducing their interiors to brownish sawdust (Klimaszewski and Peck, 1986).

Interestingly, the Ciidae family was recorded in lower numbers on *Fomes fomentarius* at the three study sites (Oued Agouf, Ain Fegoum and El Maktoua) during the two study years (2015 and 2016), likely due to the timing of the collection in late April, which coincided with the sporulation of the tinder fungus. Our results align with those obtained by Rose (2011), who noted a lower presence of Ciidae beetles in late April 2008 and 2009. Kula et al. (1999) and Jonsell et al. (1999) reported that the maturity of sporophores is a significant factor influencing the Fomes fauna, depending on whether the sporophore is dead or alive. Jonsell and Nordlander (2002) showed that insects associated with polypore fungi can serve as valuable indicators of habitat conservation status and faunal assemblages.

The decomposers collected in three unburned subareas (Oued Agouf, Ain Fegoum and El Maktoua) were Tenebrionidae, representing almost equivalent rates that do not exceed 1% at the two stations (El-Kala National Park and Souk Ahras). These results are consistent with those obtained by Daas et al. (2016), who reported rates not exceeding 8% in the two stations.

Insects found on polypores may indicate the condition of the habitat and the diversity of other species present. Insects, particularly those of the order Coleoptera, are, therefore, good indicators of ecosystem quality and the impact of management practices on the forest environment (Nageleisen and Bouget, 2009). The genus *Triplax* is known to be xylomycophagous at all stages (Dajoz, 1985). All *Triplax* species inhabit a variety of wood fungi (Bekchiev et al., 2012), with *Triplax melanocephala* often found exclusively in tinder fungus (Dajoz, 1959). According to our research, *Triplax melanocephala* appears to be restricted to the Collo (Skikda) Massifs, particularly in association with the old oyster tinder fungus *Fomes fomentarius*. This finding is supported by Dajoz (1985), who noted that *Fomes fomentarius* is exploited by the larvae of *Triplax* and *Mycetophagus*. He also reported the presence of 142 specimens of *Triplax melanocephala* in three stations studied in Europe. Furthermore, Franc (2001) deduced that *Triplax melanocephala* occurs scatteringly and rarely in warm deciduous forests of Southern and Central Europe, often preferring xerothermic habitats.

Based on our research carried out in Algeria, we have been able to create an initial list of species found in cork oak forests. Our study recorded *Triplax melanocephala*, belonging to the family Erotylidae, for the first time in Algeria. The discovery this new species for the Algerian fauna occurred almost simultaneously in three different locations in the Collo Massif, likely due to the limited knowledge of the Algerian fauna. This work opens new perspectives that will be extended to other humid regions of Algeria and North Africa.

5 SUMMARY

5 POVZETEK

Na območju od požarov neprizadetega gozda hrasta plutovca v gorskem masivu Collo na severovzhodu Alžirije smo opravili raziskavo populacij hroščev. Osredotočili smo se na vrste rodu *Triplax*, ki spadajo v družino Erotylidae. Taksonomska skupina je na območju severne Afrike slabo raziskana, vrste pa pogosto živijo v trosnjakih gliv, predvsem razpadajočih. Raziskava je imela dva cilja: prvič, pripraviti seznam vrst hroščev, ki se pojavljajo v sestojih hrasta plutovca; in drugič, pripraviti seznam vrst hroščev, ki jih v tovrstnih habitatih najdemo v trosnjakih gliv rodu *Fomes*. Favna v glivah tega rodu na območju masiva Collo v Alžiriji namreč še ni bila raziskana. Rezultati te raziskave bodo prispevali k poznavanju saproksilnih žuželk v različnih tipih ekosistemov v Alžiriji.

Lokacija raziskave v masivu Collo zajema gozdnato pogorje na severovzhodu Alžirije, za katero je značilno vlažno sredozemsko podnebje z zmernimi in dežjem bogatimi zimami ter vročimi in suhimi poletji. Hrast plutovec je močno razširjen, sestoji pa zagotavljajo skoraj tretjino (30 %) celotne proizvodnje plute v državi. Tla so relativno bogata, globoka in precej odporna proti vodni eroziji.

Pojavljanje izbranih taksonomskih skupin hroščev je bilo obravnavano z dvema metodama, in sicer: (1) s pastmi Barber, in (2) disekcijo (razrez) trosnjakov, najdene na hrastih plutovcih. Vzorčenje je bilo opravljeno v razponu treh mesecev (april-junij) ter dveh zaporednih letih (2015 in 2016). Lokacije vzorčenja so bile tri: Oued Agouf, Ain Fegoum in El Maktoua. Na vsaki lokaciji je bilo postavljenih po 12 pasti, ki so bile razporejene 1-3 m od dnišča izbranih dreves hrasta plutovca. Tam so bile v 2-tedenskih intervalih puščene po 48 ur, nato pa vsakokrat izpraznjene. Vzorčenje je neprekinjeno potekalo 3 mesece. Poleg tega so bili vsakokrat vzorčeni tudi osebki v razpadajočih trosnjakih glive rodu *Fomes*. Osebki v pasteh so bili identificirani v zoološkem laboratoriju Nacionalne veterinarske šole v El Alia. Identifikacija je potekala s stereo-mikroskopom (Leica MSV266), opremljenim z integrirano kamero (Olympus DP 73) za zajem slik. Za določanje vrst so bili uporabljeni različni določevalni ključi.

Podatki o najdbah vrst so bili analizirani z več ekološkimi indeksi: (1) relativna abundanca, (2) Shannonov indeks raznolikosti, (3) indeks enakomernosti (uravnoteženosti), ter (4) kazalnik maksimalne pestrosti. Programsko orodje PAST (PAleontologicalSTatistics) je bilo uporabljeno za izračun vseh 4 kazalnikov.

V pasteh Barber je bilo ulovljenih 385 osebkov hroščev v letu 2015 in 545 v letu 2016. Na lokaciji Oued Agouf je med identificiranimi vrstami prevladovala vrsta *Sisyphus schaefferi*, druga najpogostejša je bila vrsta *Opatrum sabulosum*. Na lokaciji Ain Fegoum je bila leta 2015 dominantna vrsta *Ampedus nigerrimus*, leta 2016 pa vrsta *Triplax melanocephala*. Na lokaciji El Maktoua je leta 2015 prevladovala vrsta *Otiorhynchus rugifrons*, leta 2016 pa *Sisyphus schaefferi*.

Analiza pestrosti z Shannonovim indeksom (H') je pokazala, da se vrednosti med leti raziskave niso bistveno spreminjale in so bile v razponu 3,75 do 4,34 v letu 2015 ter 4,19 in 4,34 v letu 2016.

Pri tem smo na treh lokacijah uporabili pasti Barber, hkrati pa smo osebke zbirali tudi na trosnjakih glive *Fomes fomentarius* in v istih letih pridobili 3017 oziroma 3107 hroščev. Pri tem je bilo registriranih 86 različnih vrst v 33 družinah. Na lokaciji Oued Agouf je v letu 2015 prevladovala vrsta *Cartodere nodifer*, v letu 2016 pa vrsti *Leptusa ruficollis* in *Rhizophagus dispar*. Na lokaciji Ain Fegoum je v letu 2015 prevladovala vrsta *Rhizophagus dispar*, v letu 2016 pa *Leptusa ruficollis*. Na lokaciji El Maktoua je v letu 2015 prevladovala vrsta *Rhizophagus dispar*, v letu 2016 *Cartodere nodifer*.

Glede na rezultate raziskave je bilo mogoče ustvariti pilotni seznam vrst, ki živijo v gozdovih hrasta plutovca. Vrsta *Triplax melanocephala*, ki pripada družini Erotylidae, je bila v Alžiriji tokrat prvič popisana, to pa se je pripetilo hkrati na treh lokacijah v masivu Collo, verjetno predvsem zaradi manka znanja o favni Alžirije. To bi lahko odprlo pot novim raziskavam v drugih humidnih regijah Alžirije in severne Afrike.

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