

ANNALES

Anali za istrske in mediteranske študije
Annali di Studi istriani e mediterranee
Annals for Istrian and Mediterranean Studies
Series Historia Naturalis, 32, 2022, 1





ANNALES

Anali za istrske in mediteranske študije
Annali di Studi istriani e mediterranei
Annals for Istrian and Mediterranean Studies

Series Historia Naturalis, 32, 2022, 1

ISSN 1408-533X
e-ISSN 2591-1783

UDK 5

Letnik 32, leto 2022, številka 1

**UREDNIŠKI ODBOR/
COMITATO DI REDAZIONE/
BOARD OF EDITORS:**

Alessandro Acquavita (IT), Nicola Bettoso (IT), Christian Capapé (FR), Darko Darovec, Dušan Devetak, Jakov Dulčić (HR), Serena Fonda Umani (IT), Andrej Gogala, Daniel Golani (IL), Danijel Ivajnskič, Mitja Kaligarič, Marcelo Kovačič (HR), Andrej Kranjc, Lovrenc Lipej, Vesna Mačič (ME), Alenka Malej, Patricija Mozetič, Martina Orlando-Bonaca, Michael Stachowitsch (AT), Tom Turk, Al Vrezec

**Glavni urednik/Redattore capo/
Editor in chief:**

Darko Darovec

**Odgovorni urednik naravoslovja/
Redattore responsabile per le scienze
naturali/Natural Science Editor:**

Lovrenc Lipej

Urednica/Redattrice/Editor:

Martina Orlando-Bonaca

Prevajalci/Traduttori/Translators:

Martina Orlando-Bonaca (sl./it.)

**Oblikovalec/Progetto grafico/
Graphic design:**

Dušan Podgornik, Lovrenc Lipej

Tisk/Stampa/Print:

Založništvo PADRE d.o.o.

Izdajatelj/Editori/Published by:

Zgodovinsko društvo za južno Primorsko - Koper / Società storica del Litorale - Capodistria®

Inštitut IRRIS za raziskave, razvoj in strategije družbe, kulture in okolja / Institute IRRIS for Research, Development and Strategies of Society, Culture and Environment / Istituto IRRIS di ricerca, sviluppo e strategie della società, cultura e ambiente®

**Sedež uredništva/Sede della redazione/
Address of Editorial Board:**Nacionalni inštitut za biologijo, Morska biološka postaja Piran / Istituto nazionale di biologia, Stazione di biologia marina di Pirano / National Institute of Biology, Marine Biology Station Piran
SI-6330 Piran / Pirano, Fornace/Fornace 41, tel.: +386 5 671 2900, fax +386 5 671 2901;
e-mail: annales@mbss.org, **internet:** www.zdjp.si

Redakcija te številke je bila zaključena 30. 06. 2022.

**Sofinancirajo/Supporto finanziario/
Financially supported by:**

Javna agencija za raziskovalno dejavnost Republike Slovenije (ARRS) in Mestna občina Koper

Annales - Series Historia Naturalis izhaja dvakrat letno.

Naklada/Tiratura/Circulation:

300 izvodov/copie/copies

Revija Annales, Series Historia Naturalis je vključena v naslednje podatkovne baze / La rivista Annales, series Historia Naturalis è inserita nei seguenti data base / Articles appearing in this journal are abstracted and indexed in: BIOSIS-Zoological Record (UK); Aquatic Sciences and Fisheries Abstracts (ASFA); Elsevier B.V.: SCOPUS (NL); Directory of Open Access Journals (DOAJ).

To delo je objavljeno pod licenco / Quest'opera è distribuita con Licenza / This work is licensed under a Creative Commons BY-NC 4.0.



Navodila avtorjem in vse znanstvene revije in članki so brezplačno dostopni na spletni strani <https://zdjp.si/en/p/annalesshn/>
The submission guidelines and all scientific journals and articles are available free of charge on the website <https://zdjp.si/en/p/annalesshn/>
Le norme redazionali e tutti le riviste scientifiche e gli articoli sono disponibili gratuitamente sul sito <https://zdjp.si/en/p/annalesshn/>



VSEBINA / INDICE GENERALE / CONTENTS 2022(1)

SREDOZEMSKI MORSKI PSI

SQUALI MEDITERRANEI

MEDITERRANEAN SHARKS

Farid HEMIDA, Christian REYNAUD & Christian CAPAPÉ

Observations on Thresher Shark, *Alopias vulpinus* (Chondrichthyes: Alopiidae) from the Coast of Algeria (Southwestern Mediterranean Sea) 1
Opazovanja morskih lisic, Alopias vulpinus (Chondrichthyes: Alopiidae) ob alžirski obali (jugozahodno Sredozemsko morje)

Elif ÖZGÜR ÖZBEK & Hakan KABASAKAL

Notes on Smoothback Angel Shark, *Squatina oculata* (Squatiniiformes: Squatinidae) caught in the Gulf of Antalya 9
Zapis o pegastih sklatih, Squatina oculata (Squatiniiformes: Squatinidae), ujetih v Antalijskem zalivu

Alessandro PAGANO & Alessandro DE MADDALENA

Underwater Observations of the Rare Angular Roughshark *Oxynotus centrina* (Chondrichthyes: Squalidae) in the Waters of Santa Tecla (Sicily, Italy) 17
Podvodna opazovanja redkega morskega prašiča, Oxynotus centrina (Chondrichthyes: Squalidae) v vodah Sante Tecele (Sicilija, Italija)

Deniz ERGÜDEN, Deniz AYAS & Hakan KABASAKAL

Morphometric Measurements of Three Young Carcharhinid Species from Northeastern Levant (Mediterranean Sea) 25
Morfometrične meritve mladičev treh vrst morskih psov iz družine Carcharhinidae iz severnovzhodnega Levanta (Sredozemsko morje)

Hakan KABASAKAL

Projections on the Future of Deep-Sea Sharks in the Sea of Marmara, Where Deep Zones Are Threatened by Deoxygenation: a Review 35

Napovedi o prihodnosti globomorskih morskih psov v Marmarskem morju, ogroženem zaradi pomanjkanja kisika: pregled

BIOINVAZIJA

BIOINVASIONE

BIOINVASION

Alan DEIDUN, Bruno ZAVA & Maria CORSINI-FOKA

Distribution Extension of *Lutjanus argentimaculatus* (Lutjanidae) and *Psenes pellucidus* (Nomeidae) to the Waters of Malta, Central Mediterranean Sea 49

Širjenje areala vrst Lutjanus argentimaculatus (Lutjanidae) in Psenes pellucidus (Nomeidae) v malteške vode (osrednje Sredozemsko morje)

Sami M. IBRAHIM, Abdulrazziq A. ABDULRAZIQ, Abdulghani ABDULGHANI, Sara A.A. AL MABRUK, David SALVATORI, Bruno ZAVA, Maria CORSINI-FOKA & Alan DEIDUN

First Record of *Enchelycore anatina* (Muraenidae) from Libyan Waters and an Additional Record from Southern Italy (Western Ionian Sea) 59
Prvi zapis o pojavljanju kavljazobe murene Enchelycore anatina (Muraenidae) iz libijskih voda in dodatni zapis za južno Italijo (zahodno Jonsko morje)

Rasha Ali HENEISH & Samir Ibrahim RIZKALLA

Morphometric and Meristic Characteristics of a New Record of Bluespot Mullet *Crenimugil seheli* (Pisces: Mugilidae) in Egyptian Mediterranean waters 67
Novi zapis o pojavljanju vrste Crenimugil seheli (Pisces: Mugilidae) v egiptovskih sredozemskih vodah in njene morfolometrične in meristične značilnosti

Yana SOLIMAN, Adib SAAD, Vienna HAMMOUD & Christian CAPAPÉ

Heavy Metal Concentrations in Tissues of *Siganus rivulatus* (Siganidae) from the Syrian Coast (Eastern Mediterranean Sea) 75
Vsebnost težkih kovin v tkivih marmoriranega morskega kunca Siganus rivulatus (Siganidae) iz sirske obale (vzhodno Sredozemsko morje)

IHTIOLOGIJA
 ITTIOLOGIA
 ICHTHYOLOGY

Jihade ALAHYENE, Brahim CHIAHOU, Hammou EL HABOUZ & Abdelbasset BEN-BANI

Length Based Growth Estimation of the Blue Shark *Prionace glauca* from the Moroccan Central Atlantic Coast 85
Dolžinsko-masni odnos in ocena rasti pri sinjem morskem psu (Prionace glauca) iz osrednje atlantske obale Maroka

Okan AKYOL, Altan LÖK & Funda ERDEM

Occurrence of *Cubiceps gracilis* (Nomeidae) in the Eastern Mediterranean Sea 101
Pojavljanje klateža, Cubiceps gracilis (Nomeidae), v vzhodnem Sredozemskem morju

Farid HEMIDA, Boualem BRAHMI, Christian REYNAUD & Christian CAPAPÉ

Occurrence of the Rare Driftfish *Cubiceps gracilis* (Nomeidae) from the Algerian Coast (Southwestern Mediterranean Sea) 107
Pojavljanje redkega klazeža Cubiceps gracilis (Nomeidae) z alžirske obale (jugozahodno Sredozemsko morje)

Deniz ERGÜDEN & Cemal TURAN

A Rare Occurrence of *Carapus acus* (Carapidae) in the Eastern Mediterranean, Turkey 113
Redko pojavljanje strmorinca Carapus acus (Carapidae) v vzhodnem Sredozemskem morju (Turčija)

Laith JAWAD, Murat ŞIRIN, Miloslav PETRTÝL, Ahmet ÖKTENER, Murat ÇELİK & Audai QASIM

Skeletal Abnormalities in Four Fish Species Collected from the Sea of Marmara, Turkey 119
Skeletne anomalije pri štirih vrstah rib iz Marmarskega morja (Turčija)

RAZMNOŽEVALNA EKOLOGIJA
 ECOLOGIA RIPRODUTTIVA
 REPRODUCTIVE ECOLOGY

Amaria Latefa BOUZIANI, Khaled RAHMANI, Samira AIT DARNA, Alae Eddine BELMAHI, Sihem ABID KACHOUR & Mohamed BOUDERBALA

Gonadal Histology in *Diplodus vulgaris* from the West Algerian Coast 137
Histologija gonad pri navadnem šparu (Diplodus vulgaris) iz zahodne alžirske obale

Cheikhna Yero GANDEGA, Nassima EL OMRANI, Rezan O. RASHEED, Mohammed RAMDANI & Roger FLOWER

The Growth and Reproduction of Two Sparidae, *Pagrus caeruleostictus* and *Pagellus bellottii* in Northern Mauritanian Waters (Eastern Tropical Atlantic) 143
Rast in razmnoževanje dveh vrst pagrov, Pagrus caeruleostictus in Pagellus bellottii v severnih mavretanskih vodah (vzhodni tropski Atlantik)

Nassima EL OMRANI, Hammou EL HABOUZ, Abdellah BOUHAIMI, Jaouad ABOU OUALID, Abdellatif MOUKRIM, Jamila GOUZOU, Mohammed RAMDANI, Roger FLOWER & Abdelbasset BEN-BANI

The Reproductive Biology of the Pouting *Trisopterus luscus* from the Atlantic Coast of Morocco 155
Reproduktivna biologija francoskega moliča (Trisopterus luscus) iz atlantske obale Maroka

Mourad CHÉRIF, Rimel BENMESSAOUD & Christian CAPAPÉ

Growth Patterns and Age Structure of *Mullus surmuletus* (Mullidae) from the Northern Coast of Tunisia (Central Mediterranean Sea) 173
Rastni parametri in starostna struktura progastih bradačev Mullus surmuletus (Mullidae) iz severne tunizijske obale (osrednje Sredozemsko morje)

FLORA

FLORA

FLORA

Martina ORLANDO-BONACA, Erik LIPEJ, Romina BONACA & Leon Lojze ZAMUDA

Improvement of the Ecological Status of the *Cymodocea nodosa* Meadow near the Port of Koper 185
Izboljšanje ekološkega stanja morskega travnika kolenčaste cimodoceje (Cymodocea nodosa) v bližini kopskega pristanišča

FAVNA

FAVNA

FAVNA

Manja ROGELJA, Martin VODOPIVEC & Alenka MALEJ

Cestum veneris Lesueur, 1813 (Ctenophora) – a Rare Guest in the Northern Adriatic Sea 197
Cestum veneris Lesueur, 1813 (Ctenophora) – redek gost v severnem Jadranu

Adla KAHRIĆ, Dalila DELIĆ & Dejan KULIJER

Notospermus annulatus (Nemertea: Lineidae), a New Record for Bosnia and Herzegovina 205
Notospermus annulatus (Nemertea: Lineidae), prvi zapis o pojavljanju za Bosno in Hercegovino

Andrea LOMBARDO & Giuliana MARLETTA

Report of an Interesting *Trapania* (Gastropoda: Nudibranchia: Goniodorididae) Specimen from Central Eastern Sicily 211
Zapis o zanimivem primerku iz rodu Trapania (Gastropoda: Nudibranchia: Goniodorididae) iz osrednje vzhodne Sicilije

Abdelkarim DERBALI & Othman JARBOUI

Stock Assessment, Cartography and Sexuality of the Wedge Clam *Donax trunculus* in the Gulf of Gabes (Tunisia) 217
Ocena staleža, kartografija in spolnost klinaste školjke Donax trunculus v gabeškem zalivu (Tunizija)

Abdelkarim DERBALI, Aymen HADJ TAIEB & Othman JARBOUI

Length-Weight Relationships and Density of Bivalve Species in the Shellfish Production Area of Zarzis (Tunisia, Central Mediterranean Sea) 229
Dolžinsko-masni odnos in gostota školjk na gojišču školjk v predelu Zarsisa (Tunizija, osrednje Sredozemsko morje)

Toni KOREN

The Diversity of Moths (Lepidoptera: Heterocera) of Significant Landscape Donji Kamenjak and Medulin Archipelago, Istria, Croatia 237
Raznolikost nočnih metuljev (Lepidoptera: Heterocera) Pomembne pokrajine Donji Kamenjak in Medulinski arhipelag, Istra, Hrvaška

OCENE IN POROČILA

RECENSIONI E RELAZIONI

REVIEWS AND REPORTS

Ines Mandić Mulec & Nives Ogrinc

Recenzija knjige: Mikrobn biogeokemija vod 263

Kazalo k slikam na ovitku 265

Index to images on the cover 265

received: 2022-03-11

DOI 10.19233/ASHN.2022.25

THE DIVERSITY OF MOTHS (LEPIDOPTERA: HETEROCERA) OF SIGNIFICANT LANDSCAPE DONJI KAMENJAK AND MEDULIN ARCHIPELAGO, ISTRIA, CROATIA

Toni KOREN

Association Hyla, Zagreb, Croatia, Association Hyla, Zagreb, Croatia
e-mail: toni.koren@hhdhyla.hr

ABSTRACT

The moth diversity of Significant landscape Donji Kamenjak and Medulin archipelago was surveyed during 2021. Together with the data collected in several field trips in previous years, 446 species of moths have been recorded in the area so far. Many of the recorded species belong to the seldomly recorded moth species in Croatia and some represent only the second or third finding for the country while for several species have been recorded in Istria peninsula for the first time. One species, Eupithecia ultimaria Boisduval, 1840 is reported as new to the fauna of Croatia. Three main threats were established for the moth diversity, natural succession due to the lack of regular grazing, a large network of paths and roads leading to the habitat phragmentation and the high pressure of the vehicles in summer months resulting in the rise of the carbonate dust from the macadam roads on surrounding grasslands and vegetation.

Key words: calcareus grasslands, maquis, faunistic, light trapping, Natura 2000

LA DIVERSITÀ DELLE FALENE (LEPIDOPTERA: HETEROCERA) DEL PAESAGGIO SIGNIFICATIVO DI DONJI KAMENJAK E DELL'ARCIPELAGO DI MEDULIN, ISTRIA, CROAZIA

SINTESI

La diversità delle falene del Paesaggio significativo di Donji Kamenjak e dell'arcipelago di Medulin è stata studiata nel corso del 2021. Insieme ai dati raccolti in diverse escursioni sul campo negli anni precedenti, finora sono state registrate 446 specie di falene nell'area. Molte delle specie registrate appartengono a specie di falene raramente registrate in Croazia e alcune rappresentano solo il secondo o il terzo ritrovamento per il Paese, mentre diverse specie sono state registrate per la prima volta nella penisola istriana. Una specie, Eupithecia ultimaria Boisduval, 1840, è stata segnalata come nuova per la fauna della Croazia. Sono state individuate tre minacce principali per la diversità delle falene: la successione naturale dovuta alla mancanza di pascolo regolare, una vasta rete di sentieri e strade che porta alla frammentazione dell'habitat e l'elevata pressione dei veicoli nei mesi estivi che provoca l'aumento della polvere di carbonato dalle strade in macadam sulle praterie e sulla vegetazione circostanti.

Parole chiave: praterie calcaree, macchia mediterranea, faunistica, trappole di luce, Natura 2000

INTRODUCTION

The Istrian peninsula (45°12'N 13°54'E) is located in the northern part of the Adriatic Sea, between the Gulfs of Trieste and Kvarner. It extends over three countries: Croatia, Slovenia, and Italy. Only a small part in the north lies in Italy, and the north-western part is in Slovenia. Along the northern border of the County the countryside is hilly, including part of the mountain massif of Čičarija with the highest peak Veliki Planik (1272 m). In general, Istria is a mosaic of different habitat types and small villages. One third of the peninsula is covered by woodland, while the remaining open land comprises agricultural areas with grasslands, meadows and arable land. Istria can be divided into three different geological areas. The northern and north-eastern part, with relatively scarce vegetation and bare Karst surfaces, is called 'White Istria'. South-west of this is an area of lower flysch tracts consisting of impermeable marl, clay and sandstone known as 'Grey Istria'. Most of the coastline is comprised of limestone terraces covered with red earth, giving it the name 'Red Istria'. One-third of the peninsula is covered by woodland, while the remaining open land comprises agricultural areas with grasslands, meadows, and arable land.

The moth diversity of the Istria peninsula is in general poorly known and it has been studied most intensively in the first half of the 20th century when it was still a part of the Austro-Hungarian empire. At the time several parts of the peninsula were investigated in more detail, including Brijuni islands (Rebel, 1913a, 1914), Mt. Učka, and the adjacent coastal regions (Rebel, 1924, 1913b, 1912; Schawerda, 1920). Recently two studies were published, but dealing with a limited number of localities in the central part of Istria, the area around Pazin (Koren & Ladavac, 2013) and the Motovun forest (Koren *et al.*, 2015). No recent studies for the southern part of Istria exist, and the historical data is rather scarce and imprecise (Galvagni, 1909; Prohaska, 1922; Stauder, 1933, 1932, 1930, 1929, 1926, 1925).

The area of Donji Kamenjak represents one of the best-preserved complexes of grassland habitats in the southern part of the peninsula. It is one of the last remaining natural areas in the area, which remained largely preserved and uninhabited mainly due to the long-term presence of the army in the area from the time of the Austro-Hungarian empire up to several decades ago. Calcareous grasslands and their successive states cover most of the area and areas such unique habitats not present anywhere else in southern Istria. Such grasslands are one of the scarcest habitats across the whole peninsula, especially in the coastal zones which

are almost completely under the strong influence of tourism and intensive development. Grasslands are also key habitats for many insect species across the temperate region of Euroasia, especially Lepidoptera (Settele *et al.*, 2008). This is easily seen in butterflies across the peninsula, with grasslands being limiting factors for the presence of many previously more widespread species (Koren *et al.*, 2018). In the current times in the area of Donji Kamenjak, such grasslands are usually small in surface and are in most cases partially overgrown and surrounded by other habitats that are the results of their succession like garigues, maquis and forests. Still, this is an area of immense floristic biodiversity. The flora of the area has been studied in more detail and more than 430 plant taxa have been identified in the area (Paljar *et al.*, 2009). The fauna of the area is much less investigated and for some insect groups completely unknown. With respect to Lepidoptera, only the data about butterflies of the area were so far partially published (Koren *et al.*, 2018). Nothing about the moth diversity of Donji Kamenjak is known in the scientific literature.

This work aims to present the first systematic survey of moths (Lepidoptera: Heterocera) of Donji Kamenjak to create a baseline for future moth studies and population monitoring.

MATERIAL AND METHODS

Study area

Donji Kamenjak is the southernmost part of the Istrian peninsula, located just south of the village Premantura, near Pula. It has been declared protected as Significant Landscape Donji Kamenjak and Medulin Archipelago (in 1996 by the Assembly of the County of Istria owing to landscape and natural and cultural values (Anonymous, 1996, 2002). Significant landscapes are one of the categories of national protected areas in Croatia. Their purpose is to protect the landscape values, biodiversity or cultural and historical values or the landscape and preserve their unique features. The land area of significant landscape, except for the islands, is included in Natura 2000 ecological network (HR2000616 – Donji Kamenjak).

The area of Donji Kamenjak is a small peninsula, connected by a narrow part with the mainland, with very indented and long coastline, which gives it the characteristics of an island. The investigated area is characterized by a Mediterranean climate (Zaninović, 2008).

The area of Donji Kamenjak belongs to the Mediterranean vegetation region and the largest part of the area (197,09 ha) is covered in coastal evergreen

Tab. 1: List of surveyed localities in the area of Donji Kamenjak. Coordinates are given in WGS84 coordinate system, z - altitude.**Tab. 1: Seznam raziskovanih nahajališč na območju Donjega Kamenjaka. Koordinate so podane v koordinatnem sistemu WGS84, z - nadmorska višina.**

	Locality	WGS N	WGS E	Z
1.	Donji Kamenjak, Rt. Grakalovac, educational path "dinosaurs", edge of coastal evergreen forests and maquis, grasslands As. <i>Chrysopogoni-Euphorbietum nicaeensis</i> H-ic. (1956) 1958	44,79244	13,90852	8
2.	Donji Kamenjak, near the pond, As. <i>Chrysopogoni-Euphorbietum nicaeensis</i> H-ic. (1956) 1958	44,793812	13,91231	8
3.	Donji Kamenjak, Plovanije, edge of coastal evergreen forests and maquis, grasslands As. <i>Chrysopogoni-Euphorbietum nicaeensis</i> H-ic. (1956) 1958 with a significant presence of <i>Juniperus oxycedrus</i> bushes	44,783447	13,90793	0
4.	Donji Kamenjak, west of Školjić bay, edge of coastal evergreen forests and maquis, grasslands As. <i>Chrysopogoni-Euphorbietum nicaeensis</i> H-ic. (1956) 1958 with a significant presence of <i>Juniperus oxycedrus</i> bushes	44,784853	13,91138	10
5.	Donji Kamenjak, slopes near bay Portić, As. <i>Chrysopogoni-Euphorbietum nicaeensis</i> H-ic. (1956) 1958	44,778868	13,91144	0
6.	Donji Kamenjak, Radovica, Ivanšovica, As. <i>Chrysopogoni-Euphorbietum nicaeensis</i> H-ic. (1956) 1958	44,775746	13,90846	0
7.	Donji Kamenjak, bay Debeljak, coastal evergreen forests and maquis	44,771009	13,91726	0

forests and maquis (Ljubičić & Bogdanović, 2014). The grasslands are the second largest habitat type in the area and cover 67,63 ha of Donji Kamenjak. The two most prevalent grassland types are Sub-Mediterranean and epimediterranean dry grasslands (*Scorzonero-Chrysopogonetalia* Horvatić et al. (1956) 1958) rocky pastures of the order *Chrysopogoni-Euphorbietum nicaeensis* Horvatić (1956) 1958 (Ljubičić & Bogdanović, 2014). On many grasslands stands of juniper (*Juniperus oxycedrus*) are a common occurrence, and in some places succession toward garrigues and maquis is evident. Agricultural areas in the area used to be intensively cultivated, while today they are mostly neglected. Parts of the coastal zones have been planted with allochthonous *Pinus halepensis* to provide shade to numerous tourists in the summer months. Aside from the natural succession, touristic activity seems to be the main threat to the biological diversity of the area including excessive traffic, especially in the summer months (Carić & Jakelić, 2018). At that time, dust with macadam covered almost all vegetation within a radius of a few meters from the road.

Moth survey

This survey was mainly conducted on a total of 30 nights from February to December 2021 on seven localities (Tab. 1). The data were supplemented by

observations made between 2014 and 2020 in the same area. Two main light-trapping sources were used. The primary method was light tent-pyramids consisting of a metal frame, UV lamps connected to a 12 V battery and covered with a white canvas. During each visit, six tent pyramids were used, distanced about ten meters apart. The second method was the usage of a 6W 12V Portable Heath Moth Trap which was left on site then collected the following morning. Two to three Portable Heath Moth Traps were used per locality and night. Both methods were used at each locality, depending on the weather conditions, mainly strong winds that are a common occurrence in the area, and does not allow for the standing light-tents to be used.

The android application and digital platform Biologer were used to record field data during this research (Popović et al., 2020). The moths that could not be identified in the field were collected, prepared, and stored in the author's private collection (Collection Koren in Zagreb). Such specimens were dissected and identified based on their internal genital structures.

Moths were identified by a large number of different identification keys. For the Noctuidae family books from the series, Noctuidae Europeaea were used (Fibiger, 1990, 1993, 1997; Ronkay & Ronkay, 1994, 1995; Ronkay et al., 2001; Hacker et al., 2002; Goater et al., 2003; Zilli et al., 2005; Fibiger et al., 2007, 2009, 2010; Witt & Ronkay, 2011).

For the Geometridae family book series *The Geometrid Moths of Europae* was used (Hausmann, 2001, 2004; Mironov, 2003, Hausmann & Viidalepp, 2012; Skou & Sihvonen, 2015; Muller et al., 2019). For other larger moths, different available literature was used (Leraut, 2012, 2009, 2006; Macek et al., 2012; Nowacki, 1998)2012; Nowacki, 1998. For Microlepidoptera all the available literature was used including the book series *Microlepidoptera of Europe* (Gaedike, 2019; Goater et al., 2005; Huemer & Karsholt, 2005, 1999), *Pyraloidea of Europe* (Slamka, 2019, 2013, 2008, 2006), *Tortricidae of Europe* (Razowski, 2003) and the Internet website *Lepiforum.de* (Lepiforum e.V., 2021). The taxonomy of the species follows the *Fauna Europaea* website (de Jong et al., 2014) with minor changes related to recent taxonomic changes.

The list of surveyed localities, with coordinates and altitudes, is given in tab. 1 while the map is presented in Fig. 1. The habitat on most of the

surveyed localities belongs to the grasslands of the association *Chrysopogoni-Euphorbietum nicaeensis* Horvatić. (1956) 1958 (Ljubičić & Bogdanović, 2014). However, all the grassland fragments are extremely small, usually in some state of succession and always surrounded by maquis, forests and a combination of the habitats. Accordingly, the species from all of the mentioned habitats were attracted to the light traps.

RESULTS

This survey generated more than 2300 moth records generating a total of 446 species (Appendix 1). The moth families are listed in taxonomic order (Kristensen et al., 2007) while the species within each family are listed alphabetically. A small proportion of the overall sample remains unidentified for the present, as their taxonomic status is currently regarded as uncertain.

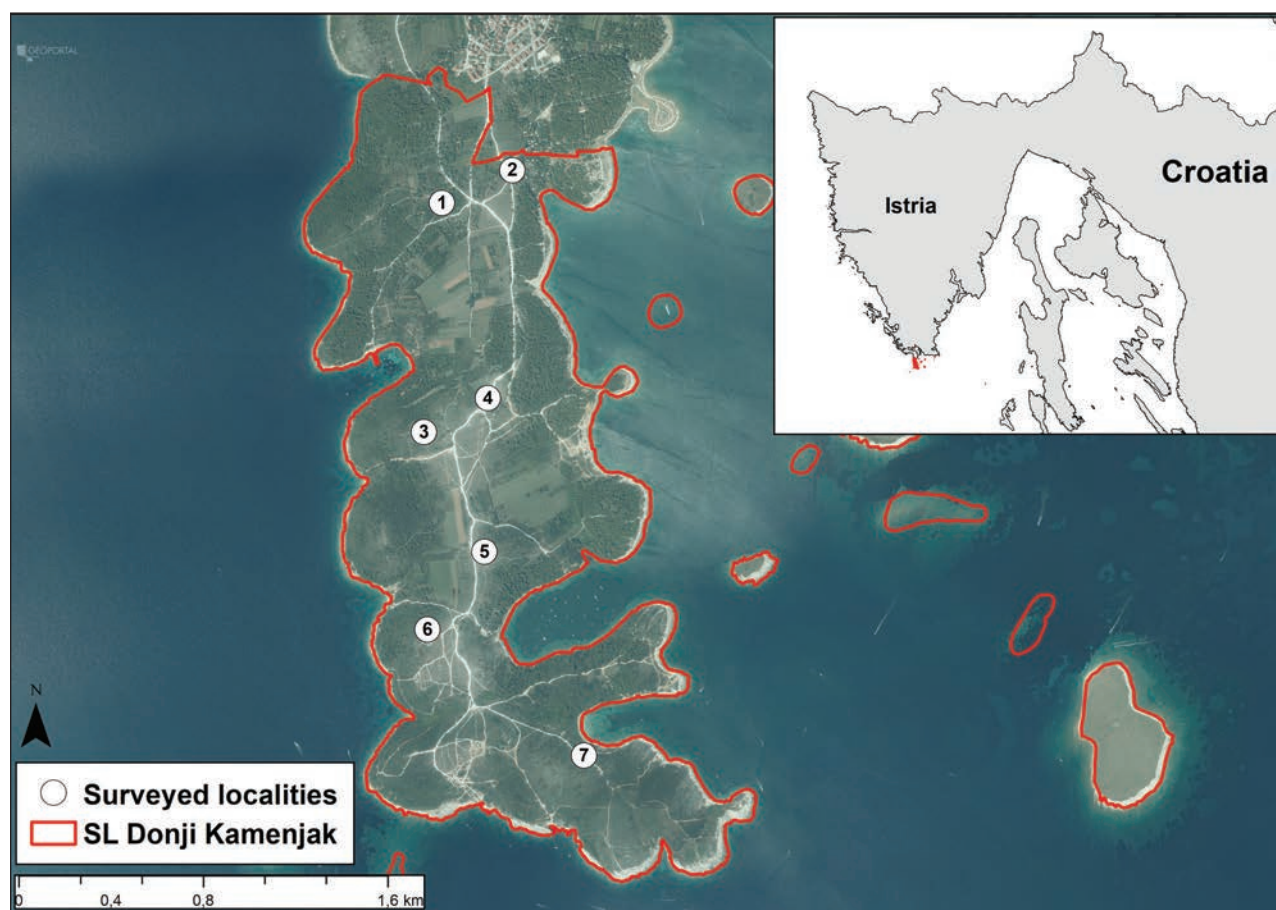


Fig. 1: Surveyed localities on Significant landscape Donji Kamenjak and Medulin Archipelago. Locality numbers correspond to the ones given in Tab. 1.

Sl. 1: Raziskane lokacije na Pomembni krajini Donji Kamenjak in Medulinski arhipelag. Številke krajev ustrezajo tistim v Tab. 1.

DISCUSSION

Historical researches of moth diversity are almost non-existent for most parts of Croatia, and this is particularly true for the area of Donji Kamenjak. Either researchers who have visited the current borders of the Republic of Croatia have not visited the Kamenjak area during their work or else they have not yet published their results. The closest historical records refer to the toponym Pula (Rebel, 1904; Galvagni, 1909; rebel, 1914; Schawerda, 1919; Stauder, 1914, 1920, 1923a, 1923b, 1925, 1926, 1927, 1929, 1930, 1932, 1933; Witt 1987), but it is not clear exactly where the finds were collected in the Pula area. Since Premantura is a historical settlement, we can conclude that in the case of former researchers collecting in the area around Premantura (including Donji Kamenjak), they would most likely use the toponym Premantura (Promontore in Italian). As this is not the case, it is most probable that no targeted moth collecting previously occurred in the area of Donji Kamenjak.

The recorded number of 446 moth species represents a first baseline for the moth diversity of Donji Kamenjak, as well the first recent survey of southern Istria. Since there are no Red lists or Red books of moths in Croatia, it is very difficult to put the collected data on the endangerment of moths in a meaningful perspective. Nevertheless, it is possible to give an overview of the rarer or more significant species recorded by this research based on the prior number of observations or their distribution.

The fauna of the moths of Donji Kamenjak has an extremely large share of true Mediterranean species of moths, that are related to warmer habitats that are primarily found on the Adriatic coast and most of the islands in Croatia. However, many of these species have never been recorded so far north, i.e. in the area of the Istrian peninsula.

One such species is *Ophiusa tirhaca* (Cramer, 1773) (Fig. 2a), a larger Noctuidae species with a wingspan of up to 50 mm. Adults fly in several generations, between March and October. The caterpillars of this species feed on the leaves of various shrubby plants, including the genus *Pistacia*. In Croatia, this species occurs exclusively in the coastal area and the northernmost finds so far come from the islands of Krk (Habeler, 2003) and Lošinj (Schawerda, 1927). The observations from Donji Kamenjak represent the northernmost distribution points in Croatia. While it is most probable that the species has a permanent population in the area, it is also a known migrant that has been recorded at many localities across Europe outside its natural range.

Another noteworthy record is *Xylocampa areola* (Esper, 1789) (Fig. 2b), which has been so far recorded from Lošinj Island (Galvagni, 1921), in the region of the Neretva River (Kučinić *et al.*, 1998) and Lokrum

island near Dubrovnik (Koren, 2020). The population from Donji Kamenjak represents the northernmost occurrence of this species in the Balkan peninsula. This species is generally common in the early spring, regularly visiting lights.

While the area of Donji Kamenjak is strongly thermophilic without any wetland vegetation, singular observation wetland moths were gathered during this survey. Examples of such species are the species *Rhizedra lutosa* (Hübner, 1803) (Fig. 2c) and *Simyra albovenosa* (Goeze, 1781). Both species can be considered wetland habitat species while *S. albovenosa* belongs to the thermohygrophilous species (Rákossy, 1996). Since these are mostly individual specimens, it is possible that these are migrations through Donji Kamenjak to some more favorable habitats.

From the Erebidae family very interesting is the record of *Araeopteron ecphaea* Hampson, 1914 (Fig. 2d). This very small species that looks more like Microlepidoptera than Erebidae was first recorded in the Croatian fauna last year from the area of Neretva river Delta (Koren, 2021a). The record from Donji Kamenjak is the second for Croatia (Koren, 2021a) and an significant expanse of its range in the country.

Another significant species recorded by this study is *Pachycnemia tibiaria* (Rambur, 1829) (Fig. 2e). It is a Mediterranean species with records from the Balkan peninsula being located mostly in the southern parts of the peninsula (Skou & Sihvonen, 2015). While the distribution is not included in the map presented in (Skou & Sihvonen, 2015), Croatia is mentioned in the text with the remark that no specimens from Croatia exist. This has changed during the last years and the species has been recorded in several areas along the Adriatic coastline and even Bosnia & Herzegovina (Koren & Martinović, 2020). The species is also known from Istria but was last recorded almost a hundred years ago from the vicinity of Pula (Schwingenschuss & Wagner, 1925). The species is relatively numerous in the area of Donji Kamenjak and this population is one of the northernmost populations in Europe in general (Skou & Sihvonen, 2015).

In the area of Donji Kamenjak another interesting, but common Geometridae species is *Tephronia theophilaria* Hausmann, 2019 (Fig. 2f). This species was described only two years ago as a stenoendemic of the northern Adriatic, and it was already known at that time that its distribution included southern Istria (Müller *et al.*, 2019). The correct identification was confirmed by the examination of the genital structures (Müller *et al.*, 2019).

From the faunistic standpoint, the most interesting is the record of *Eupithecia ultimaria* Boisduval, 1840 (Fig. 3a). This Mediterranean-Turanian species in Europe occurs in Portugal, Spain, France, Italy, and Greece (Mironov, 2003). Only a single male

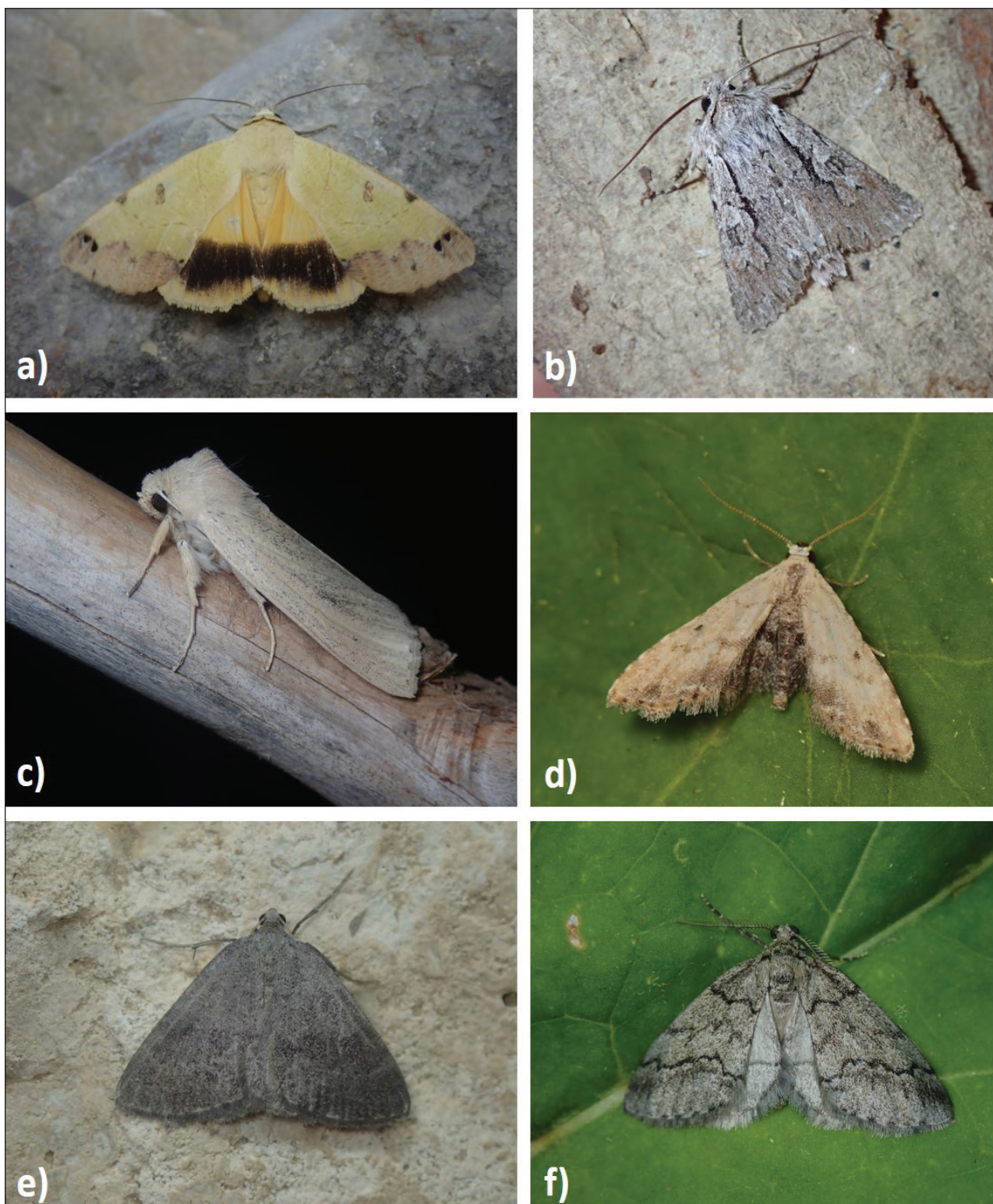


Fig. 2: Interesting moth species recorded at the area of Donji Kamenjak: a) *Ophiusa tirhaca*, b) *Xylocampa areola*, c) *Rhizedra lutosa*, d) *Araeopteron ecphaea*, e) *Pachycnemia tibiaria*, f) *Tephronia theophilaria* (Photos by T. Koren).

Sl. 2: Zanimive vrste nočnih metuljev, zabeležene na območju Donjega Kamenjaka: a) *Ophiusa tirhaca*, b) *Xylocampa areola*, c) *Rhizedra lutosa*, d) *Araeopteron ecphaea*, e) *Pachycnemia tibiaria*, f) *Tephronia theophilaria* (Fotografije T. Koren).

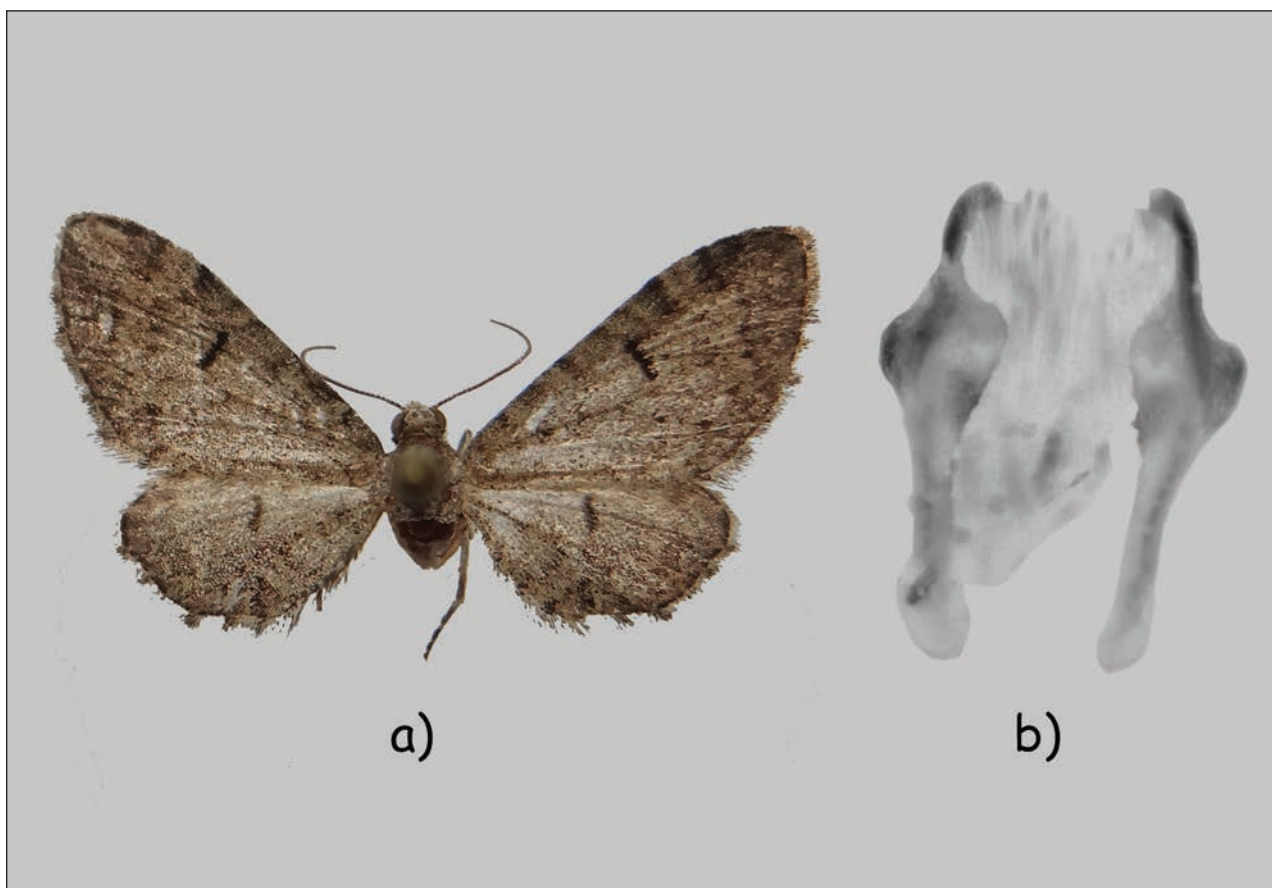


Fig. 3: a) Male of *Eupithecia ultimaria* collected at Donji Kamenjak, b) Tergum A8 of the same specimens showing the distinctive shape for this species (Photos by T. Koren).

Sl. 3: a) Samec *Eupithecia ultimaria*, ujet na Donjem Kamenjaku, b) Tergum A8 istega osebka, ki kaže značilno obliko te vrste (Fotografije T. Koren).

specimen was collected at Donji Kamenjak and was, as was the case with all collected *Eupithecia* specimens, dissected and identified based on its genital structures (Mironov, 2003). This species is very easily identifiable due to the tergum A8 being trapeziform (Fig. 3b), with rounded apical corners and a deep medial hollow in the posterior margin (Mironov, 2003). The habitat of the species is different habitats with tamarisk (Mironov, 2003). No records existed for Croatia before this survey (Mihoci, 2012; Mironov, 2003) and the closest localities were north-western Italy and Greece (Mironov, 2003). This is a new species for the moth fauna of Croatia. While the habitats with tamarisk are the result of grassland succession, it would not be beneficial to completely restore the grasslands to their natural state. The goal is to maintain the habitat diversity (grasslands, garigues, maquis, forests etc.) in the long run, in order to preserve the diversity of the area which will be beneficial also for the long-term survival of this species.

From the Microlepidoptera families, a large number of records may be interpreted as interesting, but the lack of surveys and checklists of most of the moth families belonging to the smaller moths renders this task rather difficult.

From the Pyralidae family, one of the more interesting species is *Dioryctria robiniella* (Millière, 1865) (Fig. 4a). This is a rather local and poorly known species whose occurrence in Croatia has been only recently confirmed (Koren, 2021b) even if its presence in the country was known for some time (Speidel & Asselbergs, 2000). While for the correct identification of most species of the genus, the examination of the internal male and female genital structures is necessary, this is not the case with *D. robiniella* which is very different from all other European species and can be easily recognized due to the grey coloring and the distinct black markings. The records from Donji Kamenjak represent the northernmost observations of this species in Croatia and expand the known range also to the Istria peninsula.

Another scarcer Pyralidae species recorded during this survey is *Acrobasis obtusella* (Hübner, 1796) (Fig. 4b). The species has been reported from Croatia only twice (Mann, 1869; Habeler, 2003). It is a species with a Mediterranean distribution for which there are only a few finds for the entire Balkan Peninsula (Plant & Jakšić, 2018).

Acrobasis porphyrella (Duponchel, 1836) has been recorded only the third time for Croatia (Rebel, 1919; Prohaska, 1922). It is a rare species in the whole Balkan peninsula known so far only from Croatia and Albania (Plant & Jakšić, 2018).

Stemmatophora combustalis (Fischer v. Röslerstamm, 1842) (Fig. 4c) belongs to the more attractive Microlepidoptera species. This species is present in Croatia only on the Adriatic coast and the closest finds come from Lovran (Schawerda, 1921) and the island Krk (Habeler, 2003). It is a relatively rare species in Europe with few recent observations (Slamka, 2006). It inhabits dry open habitats where its hostplant, *Erica manipuliflora* grows (Slamka, 2006).

One extremely numerous species of grass moth in the area of Donji Kamenjak is a small species *Metasia corsicalis* (Duponchel, 1833) (Fig. 4d). Only several observations of this species exist for Croatia (Rebel, 1913a; Habeler, 2003; Slamka, 2013) and the only data from Istria originate from Veliki Brijun (Rebel, 1913a). In the area of Donji Kamenjak, this is very numerous and common species arriving at the light traps in great numbers.

Antigastra catalaunalis (Duponchel, 1833) (Fig. 4e) has seldomly been recorded in Croatia (Rebel, 1904, 1914; Klimesch, 1942; Habeler, 2003; Slamka, 2013) and the only record from Istria is from Veliki Brijun island (Rebel, 1914). The observations from Donji Kamenjak are the second record for Istria. The species inhabits different types of dry habitats (Slamka, 2013), and the grasslands of Donji Kamenjak seem to hold a large population of this species.

From the Tortricidae family *Cydia molybdana* (Constant, 1884) (Fig. 4f) is interesting. It is a species whose separation from the related species *Cydia amplana* (Hübner, 1799) has only recently been clarified (Karisch & Pinzari, 2010). The distribution of this species stretches along the Mediterranean coast, and the records for the Kamenjak area are the northernmost distribution records for Croatia (Karisch & Pinzari, 2010).

Several other noteworthy records of resident, but most probably overlooked species were made. For *Kessleria alpicella* (Stainton, 1851) Donji Kamenjak is the second record for Croatia (Huemer & Tarmann, 1991) and the same is true for *Mesophleps corsicella* (Herrich-Schäffer, 1856) with a single record so far (Habeler, 2003).

Eteobalea dohrnii (Zeller, 1847) has been previously recorded only twice (Habeler, 2001, 2003). *Tebenna micalis* (Mann, 1857) has been recorded in Croatia only twice before (Mann, 1857; Habeler, 2003). It is resident in the surveyed area as more than 15 individuals were observed during this study.

The limited number of observations of some Microlepidoptera species does not imply that the species are rare in Croatia. Indeed, some species may even be very common. The scarcity of records is mostly due to the lack of surveys and publishing of the existing results. The small number of published records may, especially in Microlepidoptera, give an incorrect notion of their rarity (Gumhalter & Kučinić, 2020; Gumhalter, 2021). Also, it may lead to the conclusion that nothing is known about Microlepidoptera of Croatia and many species could be reported as new for the country (Richter & Pastorális, 2015) which can later be found incorrect (Gumhalter, 2019). To change this, targeted surveys, as well as publishings of existing data, including checklists that contain new and verified literature data, are needed.

In addition to interesting species of moths from a faunistic point of view, one species of European importance was also recorded. *Euplagia quadripunctaria* (Poda, 1761) is listed in Annex II and IV of the Habitats Directive as „animal species of community interest whose conservation requires the designation of special areas of conservation” (Anonymous, 1992) and is one of few moth species protected by the law in Croatia (Anonymous, 2009). This species is rather common in Croatia and present in all three biogeographical regions (Kučinić *et al.*, 2014). While this species is not a target species for Natura 2000 site HR2000616 Donji Kamenjak, its presence in the area is important as in the whole Istria peninsula only one site was designated for this species - HR2001322 Vela Traba (Anonymous, 2015). In the surveyed area this species was recorded in three localities (Tab. 2).

As this survey was conducted predominantly on grasslands (of different succession states), the recorded moth diversity could be used as a baseline for their current status in the area of Donji Kamenjak, especially after change in the management (reintroduction of sheep for example) or habitat restorations. Semi-natural calcareous grasslands belong to the most species-rich habitat types of Europe (van Swaay, 2002) and their conservation and restoration are required according to the Habitat Directive of the European Union (Anonymous, 1992).

Three main threats to the grassland habitats of Donji Kamenjak were observed. The first and

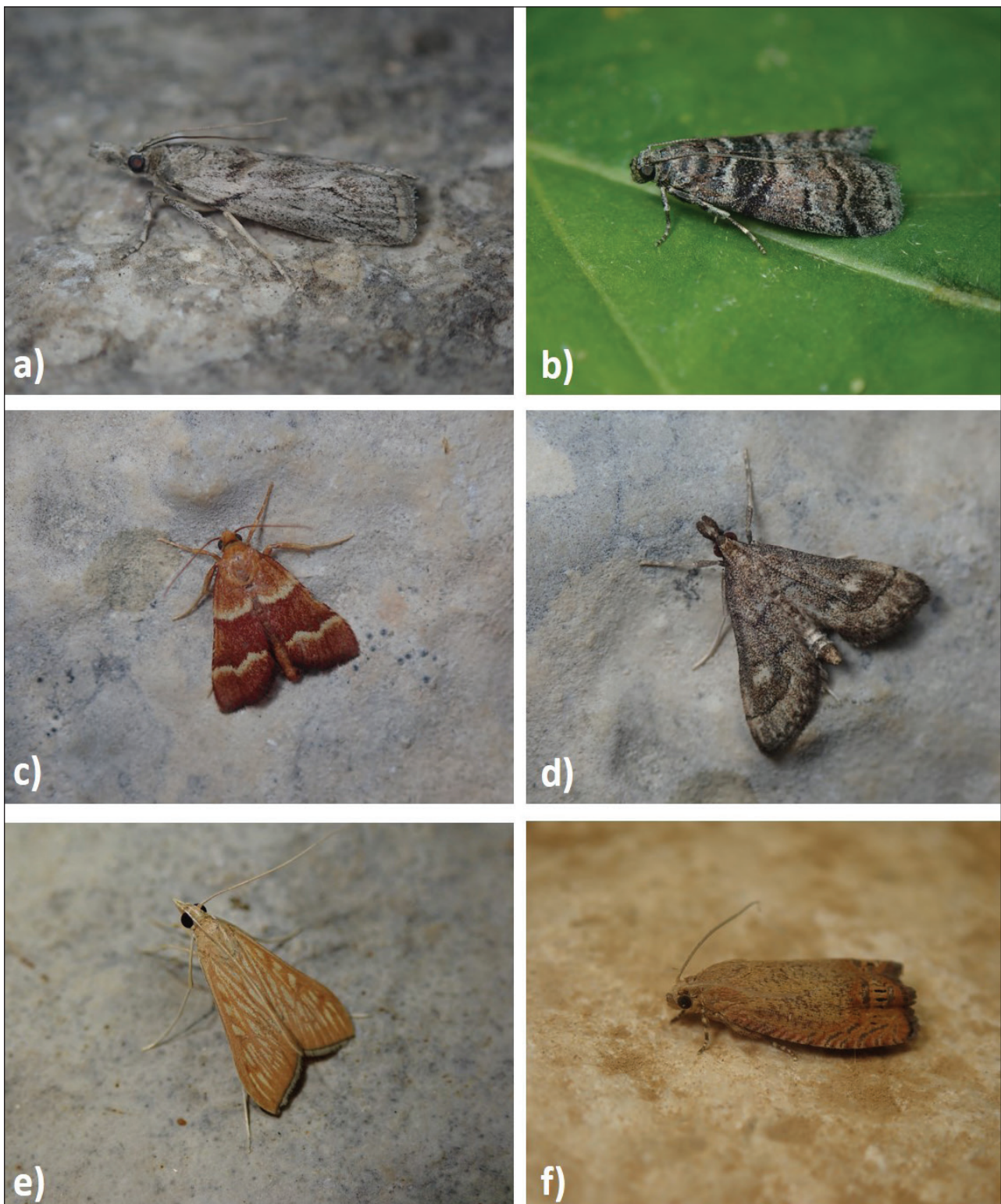


Fig. 4: Some of the interesting *Microlepidoptera* recorded during this survey: **a)** *Dioryctria robinella*, **b)** *Acrobasis obtusella*, **c)** *Stenmatophora combustalis*, **d)** *Metasia corsicalis*, **e)** *Antigastra catalaunalis*, **f)** *Cydia molybdana* (Photos by T. Koren).

Sl. 4: Nekaj zanimivih *Microlepidoptera*, zabeleženih med to raziskavo: **a)** *Dioryctria robinella*, **b)** *Acrobasis obtusella*, **c)** *Stenmatophora combustalis*, **d)** *Metasia corsicalis*, **e)** *Antigastra catalaunalis*, **f)** *Cydia molybdana* (Fotografije T. Koren).

most obvious is natural succession. In the area of Donji Kamenjak, grasslands are endangered habitats due to the abandonment of the traditional grazing which was in the area present until recently. Nowadays the sheep that for decades maintained the open grasslands are not present in the area anymore, and the succession, especially with *Juniperus oxycedrus*, is visible in most grasslands. Many private owned grasslands (and former agricultural land) across Donji Kamenjak are completely overgrown and unnatined. The grasslands that are in the public domain are maintained by the employees of the “Kamenjak” Public Institution for the Management of Protected Natural Values in the Medulin Municipality Area. Such grasslands are regularly cleared of *Juniperus oxycedrus*, *Erica arborea*, *Pinus halepensis* and similar woody species that grow sporadically on the pastures and are a sign of succession of the grasslands (Ljubičić *et al.*, 2020). The cuttings of such species should be applied as soon as possible because, in the later phase of succession and the development of dense maquis, the process is much more difficult and longer-lasting (Ljubičić *et al.*, 2020). For overgrown grasslands, where scrub biomass is high and needs to be reduced, goats can be used but very carefully because they are difficult to manage (San Miguel, 2008). For larger overgrown areas that belonged to former pastures, the burning method is also effective in eliminating unwanted vegetation of maquis created in the process of progressive succession and results in unique species composition (Moog *et al.*, 2002). However, only the reintroduction of extensive sheep grazing would be a long-term solution. As an optimal grazing load for such grasslands (pastures), moderate-intensity of sheep grazing with 1 to 2 sheep/ha is recommended (Ljubičić & Bogdanović, 2014).

Another observed threat is the extremely large number of macadams, paths, and roads used for traffic by either cars or other smaller motor vehicles. The development and presence of roads can reduce landscape permeability, leading to habitat loss, and increasing habitat fragmentation (Bennett, 2017). This is most visible in small areas like Donji Kamenjak which has a surface of about 4 km². This is especially true in the summer months when the number of cars is very high, and the roads became impenetrable barriers due to the constant ongoing traffic. One of the proposals to mitigate this is to reduce the number of roads on which cars are allowed. This practice has already been observed in the study area, where parts of the macadam are blocked by logs or stones, which we strongly support and suggest that it continue. It also makes it impossible to park vehicles on

grasslands and further degrade them. To relieve the whole of Donji Kamenjak in the future, alternative ways of entering the area should be considered, which would not be so destructive to nature. A second option is the limitation of the number of vehicles that are allowed to enter daily. The summer months themselves are very dry in the Mediterranean area and unfavorable for flora and fauna, and such a large anthropogenic impact can only further complicate the survival of moth fauna in the area of Donji Kamenjak.

The third observed problem for which it is quite difficult to determine the direct impact on moths is excessive traffic in the summer months and the chalk dust it raises on the surrounding grasslands and vegetation. This is largely reflected in the white cover on most lawns, shrubs, and trees located near the roads and can have a negative impact on flora and fauna due to inhibition of photosynthesis, reduced ability to absorb UV radiation and CO₂ (Ozimec *et al.*, 2016). Forest edges or bush edges are important habitats for many species and it is especially important to maintain such habitats in the right way. Finally, macadam-type road is a threat due to repeatedly rain rinsing of the dust material required for road maintenance. The chalk dust is rinsed from the road surface towards the grassland areas which can cause changes in soil composition and even fragmentation of grassland areas.

All of the mentioned problems should be addressed urgently to halt ongoing loss of biodiversity in the area.

CONCLUSIONS

With this survey, a previously completely unsurveyed area of Croatia in terms of moth diversity becomes one of the better-studied areas in the country. Accordingly, the basic moth diversity, especially of the larger moths of Donji Kamenjak has been established, while in Microlepidoptera additional targeted surveys are needed. This should be done by including experts for more difficult groups or the implementation of new methods like DNA barcoding (Huemer *et al.*, 2014). Nevertheless, this study should be regarded as a baseline and a first step in the long-term protection of the moth diversity of Donji Kamenjak. Such faunistic works are especially important for the appropriate management of protected areas as well as their presentation to the visitors and the interested public.

Still, this work is pure faunistic and should be regarded as the first step into more complex ecological studies which would determine the changes in species abundance and composition

following the natural succession or/and management actions that could take place in this area. As moths are suitable ecological indicators for the open and forested habitats, which has been proven in the Carpathian grasslands (Šumpich & Konvička, 2012), further steps on Donji Kamenjak would be to select permanent plots on which long-term monitoring of moths should take place. In this case, the light trapping effort should be measurable and repeatable, and this should be done over a longer period. Only with this way any changes in moth diversity of this important and protected area could be monitored.

ACKNOWLEDGMENTS

The author is thankful to the Public institution Kamenjak for recognizing the importance of this research and financially supporting it and to Goran Stjepić for usefull comments to the manuscript. Sincere thanks go to Ana Štih Koren, Daria Kranželić, Bruno Schmidt, Đurđica Majetić, Stanislav Gomboc, and Edi Gljuščić for the help and company during some of the field surveys. I am also grateful to the reviewer Colin W. Plant (Bishops Stortford, uK) for linguistic corrections and valuable comments to the manuscript.

Appendix 1: Systematic list of moths recorded in the area of Donji Kamenjak. The location number corresponds to the location numbers in Table 1.

Priloga 1: Sistematičen seznam nočnih metuljev, za-beleženih na območju Donjega Kamenjaka. Številka lokacije ustreza številkam lokacij v Tabeli 1.

	Genus and species	Locality
	Hepialidae	
1.	<i>Triodia adriaticus</i> (Osthelder, 1931)	2
2.	<i>Triodia sylvina</i> (Linnaeus, 1761)	2, 3
	Adelidae	
3.	<i>Adela croesella</i> (Scopoli, 1763)	2
	Plutellidae	
4.	<i>Plutella xylostella</i> (Linnaeus, 1758)	2, 3, 6
	Yponomeutidae	
5.	<i>Kessleria alpicella</i> (Stainton, 1851)	3
6.	<i>Yponomeuta evonymella</i> (Linnaeus, 1758)	3
7.	<i>Yponomeuta irrorella</i> (Hübner, 1796)	6
8.	<i>Yponomeuta padella</i> (Linnaeus, 1758)	3, 6
	Chimabachidae	
9.	<i>Diurnea fagella</i> (Denis & Schifferrmüller, 1775)	1
	Cosmopterigidae	
10.	<i>Eteobalea dohrnii</i> (Zeller, 1847)	6
11.	<i>Eteobalea isabellella</i> (O. G. Costa, 1836)	3, 6
12.	<i>Pyroderces argyrogrammos</i> (Zeller, 1847)	2, 3
	Elachistidae	
13.	<i>Depressaria tenebricosa</i> Zeller, 1854	5, 6
14.	<i>Ethmia bipunctella</i> (Fabricius, 1775)	6, 7
	Gelechiidae	
15.	<i>Dichomeris marginella</i> (Fabricius, 1781)	6
16.	<i>Esperia sulphurella</i> (Fabricius, 1775)	1
17.	<i>Mesophleps corsicella</i> Herrich-Schäffer, 1856	3
18.	<i>Mesophleps oxycedrella</i> (Millière, 1871)	3
19.	<i>Palumbina guerinii</i> (Stainton, 1858)	2
20.	<i>Ptocheuusa paupella</i> (Zeller, 1847)	2
21.	<i>Tuta absoluta</i> (Meyrick, 1917)	2

	Genus and species	Locality
	Lecithoceridae	
22.	<i>Odites kollarella</i> (O. G. Costa, 1832)	2, 3, 5
	Oecophoridae	
23.	<i>Batia lambdella</i> (Donovan, 1793)	3, 6
24.	<i>Epicalima formosella</i> (Denis & Schifferrmüller, 1775)	3
25.	<i>Pleurota aristella</i> (Linnaeus, 1767)	3, 5, 6
	Peleopodidae	
26.	<i>Carcina quercana</i> (Fabricius, 1775)	3, 4
	Scythrididae	
27.	<i>Scythris limbella</i> (Fabricius, 1775)	3
	Cossidae	
28.	<i>Dyspessa ulula</i> (Borkhausen, 1790)	1, 3, 4, 5, 6
29.	<i>Parahypopta caestrum</i> (Hübner, 1808)	1, 2, 3, 4, 5, 6, 7
30.	<i>Zeuzera pyrina</i> (Linnaeus, 1761)	3, 5, 6
	Limacodidae	
31.	<i>Apoda limacodes</i> (Hufnagel, 1766)	1
	Zygaenidae	
32.	<i>Zygaena filipendulae</i> (Linnaeus, 1758)	5
33.	<i>Zygaena loti</i> (Denis & Schifferrmüller, 1775)	3
34.	<i>Zygaena punctum</i> Ochsenheimer, 1808	1
	Choreutidae	
35.	<i>Choreutis nemorana</i> (Hübner, 1799)	3, 6
36.	<i>Tebenna micalis</i> (Mann, 1857)	3, 6
	Tortricidae	
37.	<i>Acleris rhombana</i> (Denis & Schifferrmüller, 1775)*	5
38.	<i>Acleris variegana</i> (Denis & Schifferrmüller, 1775)*	3, 5
39.	<i>Aethes sanguinana</i> (Treitschke, 1830)*	6
40.	<i>Aethes tesserana</i> (Denis & Schifferrmüller, 1775)*	3
41.	<i>Aethes williana</i> (Brahm, 1791)*	6
42.	<i>Agapeta hamana</i> (Linnaeus, 1758)	3, 5
43.	<i>Agapeta zoegana</i> (Linnaeus, 1767)	3, 6
44.	<i>Aleimma loeflingiana</i> (Linnaeus, 1758)	3, 6
45.	<i>Archips xylosteana</i> (Linnaeus, 1758)	3

	Genus and species	Locality
46.	<i>Cacoecimorpha pronubana</i> (Hübner, 1799)	3, 6
47.	<i>Choristoneura lafauryana</i> (Ragonot, 1875)	3
48.	<i>Clepsis consimilana</i> (Hübner, 1817)	2, 3
49.	<i>Clepsis pallidana</i> (Fabricius, 1776)	2, 5
50.	<i>Cnephasia incertana</i> (Treitschke, 1835)	3
51.	<i>Cnephasia stephensiana</i> (Doubleday, 1849)	3
52.	<i>Cochylimorpha straminea</i> (Haworth, 1811)	3
53.	<i>Cochylis posterana</i> Zeller, 1847	3, 6
54.	<i>Cydia fagiglandana</i> (Zeller, 1841)	1, 3, 5
55.	<i>Cydia molybdana</i> (Constant, 1884)*	3, 7
56.	<i>Cydia pyrivora</i> (Danilevsky, 1947)*	6
57.	<i>Cydia splendana</i> (Hübner, 1799)*	2, 6
58.	<i>Dichrorampha heegerana</i> (Duponchel, 1843)	6
59.	<i>Endothenia gentianaeana</i> (Hübner, 1799)	2, 6
60.	<i>Endothenia marginana</i> (Haworth, 1811)	3, 6
61.	<i>Epinotia dalmatana</i> (Rebel, 1891)	6
62.	<i>Epinotia festivana</i> (Hübner, 1799)	1
63.	<i>Eucosma albidulana</i> (Herrich-Schäffer, 1851)	5
64.	<i>Gypsonoma aceriana</i> (Duponchel, 1843)	3
65.	<i>Lobesia botrana</i> (Denis & Schiffermüller, 1775)	2, 3
66.	<i>Lobesia quaggana</i> Mann, 1855	3, 6
67.	<i>Lozotaeniodes cupressana</i> (Duponchel, 1836)	3, 5, 7
68.	<i>Notocelia cynosbatella</i> (Linnaeus, 1758)	3
69.	<i>Notocelia roborana</i> (Denis & Schiffermüller, 1775)	3, 5
70.	<i>Pelochrista agrestana</i> (Treitschke, 1830)	5, 6
71.	<i>Pseudococcyx tessulatana</i> (Staudinger, 1871)	3, 6
72.	<i>Rhyacionia pinicolana</i> (Doubleday, 1849)	3
73.	<i>Spilonota ocellana</i> (Denis & Schiffermüller, 1775)	3
74.	<i>Tortrix viridana</i> Linnaeus, 1758	3
75.	<i>Zeiraphera griseana</i> (Hübner, 1799)	2
	Crambidae	
76.	<i>Achyra nudalis</i> (Hübner, 1796)	1, 4
77.	<i>Agriphila inquinatella</i> (Denis & Schiffermüller, 1775)*	3, 6

	Genus and species	Locality
78.	<i>Agriphila latistria</i> (Haworth, 1811)*	2
79.	<i>Agriphila tolli</i> (Bleszynski, 1952)*	2, 3, 4, 6
80.	<i>Anania crocealis</i> (Hübner, 1796)	1
81.	<i>Anania stachydalis</i> (Germar, 1821)	6
82.	<i>Anania terrealis</i> (Treitschke, 1829)	2
83.	<i>Anania testacealis</i> (Zeller, 1847)	3, 5, 6
84.	<i>Anania verbascalis</i> (Denis & Schiffermüller, 1775)	2, 3, 4, 5, 6
85.	<i>Angustalius malacellus</i> (Duponchel, 1836)	2
86.	<i>Antigastra catalaunalis</i> (Duponchel, 1833)	5
87.	<i>Aporodes floralis</i> (Hübner, 1809)	1, 3, 6
88.	<i>Catoptria pinella</i> (Linnaeus, 1758)*	1, 3, 5, 6
89.	<i>Chrysocrambus linetella</i> (Fabricius, 1781)	3
90.	<i>Cydalima perspectalis</i> (Walker, 1859)	1, 2, 3
91.	<i>Diasemiopsis ramburialis</i> (Duponchel, 1834)	2
92.	<i>Dolicharthria punctalis</i> (Denis & Schiffermüller, 1775)	1, 3, 5, 6
93.	<i>Duponchelia fovealis</i> Zeller, 1847	2, 3, 5, 7
94.	<i>Ecpyrrorrhoe diffusalis</i> (Guenée, 1854)	3
95.	<i>Ecpyrrorrhoe rubiginalis</i> (Hübner, 1796)	5, 7
96.	<i>Euchromius bella</i> (Hübner, 1796)*	3, 5
97.	<i>Euchromius ramburiellus</i> (Duponchel, 1836)*	3
98.	<i>Euchromius superbullus</i> (Zeller, 1849)*	3
99.	<i>Hellula undalis</i> (Fabricius, 1781)	4, 7
100.	<i>Loxostege sticticalis</i> (Linnaeus, 1761)	3, 5, 6
101.	<i>Mecyna asinalis</i> (Hübner, 1819)	1, 2, 3, 4, 5, 6, 7
102.	<i>Metacrambus caretellus</i> (Zeller, 1847)	1, 3, 4, 5, 6
103.	<i>Metasia corsicalis</i> (Duponchel, 1833)	2, 3, 5, 6, 7
104.	<i>Metasia ophialis</i> (Treitschke, 1829)	1, 3, 4
105.	<i>Nomophila noctuella</i> (Denis & Schiffermüller, 1775)	1, 2, 3, 4, 5, 6, 7
106.	<i>Palpita vitrealis</i> (Rossi, 1794)	1, 2, 3, 4, 5, 6, 7
107.	<i>Pediasia contaminella</i> (Hübner, 1796)	3, 4, 5
108.	<i>Pleuroptya ruralis</i> (Scopoli, 1763)	3
109.	<i>Pyrausta aurata</i> (Scopoli, 1763)	1, 2, 3, 4, 5, 6
110.	<i>Pyrausta despicata</i> (Scopoli, 1763)	1, 2, 3, 4, 5, 6

	Genus and species	Locality
111.	<i>Pyrausta sanguinalis</i> (Linnaeus, 1767)	3, 4
112.	<i>Pyrausta virginalis</i> Duponchel, 1832	1, 2, 3, 5
113.	<i>Sclerocona acutella</i> (Eversmann, 1842)	2
114.	<i>Scoparia pyralella</i> (Denis & Schiffermüller, 1775)	3
115.	<i>Sitochroa palealis</i> (Denis & Schiffermüller, 1775)	1, 3
116.	<i>Sitochroa verticalis</i> (Linnaeus, 1758)	2, 3
117.	<i>Udea ferrugalis</i> (Hübner, 1796)	1, 3, 4, 5, 6
118.	<i>Uresiphita gilvata</i> (Fabricius, 1794)	2, 3, 4, 5, 6, 7
119.	<i>Xanthocrampus saxonellus</i> (Zincken, 1821)	2, 3, 4, 5, 6
	Pyralidae	
120.	<i>Acrobasis fallouella</i> (Ragonot, 1871)*	1, 3
121.	<i>Acrobasis obtusella</i> (Hübner, 1796)	5, 6
122.	<i>Acrobasis porphyrella</i> (Duponchel, 1836)	1, 3, 5
123.	<i>Acrobasis tumidana</i> (Denis & Schiffermüller, 1775)	1
124.	<i>Aphomia sociella</i> (Linnaeus, 1758)	5
125.	<i>Apomyelois ceratoniae</i> (Zeller, 1839)	2
126.	<i>Bostra obsoletalis</i> (Mann, 1884)	1, 3
127.	<i>Dioryctria abietella</i> (Denis & Schiffermüller, 1775)*	6
128.	<i>Dioryctria mendacella</i> (Staudinger, 1859)*	2, 3, 5, 6, 7
129.	<i>Dioryctria pineae</i> (Staudinger, 1859)*	1, 2, 3, 4, 5, 6, 7
130.	<i>Dioryctria robiniella</i> (Millière, 1865)*	1, 3, 6
131.	<i>Dioryctria simplicella</i> Heinemann, 1863*	6
132.	<i>Dioryctria sylvestrella</i> (Ratzeburg, 1840)*	7
133.	<i>Elegia atrifasciella</i> Ragonot, 1887*	3
134.	<i>Ematheudes punctella</i> (Treitschke, 1833)	1, 3, 4, 5, 6
135.	<i>Endotricha flammealis</i> (Denis & Schiffermüller, 1775)	1, 2, 3, 4, 5, 6, 7
136.	<i>Ephestia welseriella</i> (Zeller, 1848)	3, 5, 6
137.	<i>Epischia illotella</i> Zeller, 1839	3, 4
138.	<i>Etiella zinckenella</i> (Treitschke, 1832)	3
139.	<i>Homoeosoma sinuella</i> (Fabricius, 1794)	1, 2, 3
140.	<i>Hypsopygia costalis</i> (Fabricius, 1775)	2, 3, 6
141.	<i>Hypsopygia glaucinalis</i> (Linnaeus, 1758)	3, 6
142.	<i>Hypsopygia incarnatalis</i> (Zeller, 1847)	1, 2, 3, 5, 6, 7

	Genus and species	Locality
143.	<i>Hypsopygia rubidalis</i> (Denis & Schiffermüller, 1775)	3, 5
144.	<i>Hypsotropa limbella</i> Zeller, 1848	5
145.	<i>Lamoria anella</i> (Denis & Schiffermüller, 1775)	3, 5, 6
146.	<i>Metallostichodes nigrocyanaella</i> (Constant, 1865)	3, 5, 6
147.	<i>Oncocera semirubella</i> (Scopoli, 1763)	1, 2, 3
148.	<i>Pempelia palumbella</i> (Denis & Schiffermüller, 1775)	5, 6, 7
149.	<i>Phycita roborella</i> (Denis & Schiffermüller, 1775)	3
150.	<i>Pterothrixidia rufella</i> (Duponchel, 1836)	1, 3, 5, 6
151.	<i>Pyralis farinalis</i> (Linnaeus, 1758)	1
152.	<i>Pyralis regalis</i> Denis & Schiffermüller, 1775	1, 3, 4, 5, 6
153.	<i>Stemmatophora brunnealis</i> (Treitschke, 1829)	3, 5, 6
154.	<i>Stemmatophora combustalis</i> (Fischer v. Röslerstamm, 1842)	5, 6
155.	<i>Stemmatophora honestalis</i> (Treitschke, 1829)	6
	Brahmaeidae	
156.	<i>Lemonia taraxaci</i> (Denis & Schiffermüller, 1775)	3, 4
	Lasiocampidae	
157.	<i>Dendrolimus pini</i> (Linnaeus, 1758)	1, 3, 4, 5, 6
158.	<i>Gastropacha quercifolia</i> (Linnaeus, 1758)	1, 3, 5
159.	<i>Lasiocampa quercus</i> (Linnaeus, 1758)	1, 3, 4, 5, 6
160.	<i>Lasiocampa trifolii</i> (Denis & Schiffermüller, 1775)	3, 4, 5
161.	<i>Trichiura crataegi</i> (Linnaeus, 1758)	3, 5, 6
	Sphingidae	
162.	<i>Agrius convolvuli</i> (Linnaeus, 1758)	2
163.	<i>Hyles euphorbiae</i> (Linnaeus, 1758)	1, 3, 4, 5, 6
164.	<i>Hyles livornica</i> (Esper, 1780)	1, 3
165.	<i>Macroglossum stellatarum</i> (Linnaeus, 1758)	7
166.	<i>Marumba quercus</i> (Denis & Schiffermüller, 1775)	3, 4, 5, 6
167.	<i>Sphinx ligustri</i> Linnaeus, 1758	5
168.	<i>Sphinx pinastri</i> Linnaeus, 1758	3
	Drepanidae	
169.	<i>Cilix glaucata</i> (Scopoli, 1763)	1, 2, 3, 4, 7
170.	<i>Cymatophorina diluta</i> (Denis & Schiffermüller, 1775)	2
171.	<i>Thyatira batis</i> (Linnaeus, 1758)	7

	Genus and species	Locality
172.	<i>Watsonalla cultraria</i> (Fabricius, 1775)	3
173.	<i>Watsonalla uncinula</i> (Borkhausen, 1790)	1, 2, 3, 4, 5, 6, 7
	Geometridae	
174.	<i>Agriopis bajaran</i> (Denis & Schiffermüller, 1775)	4
175.	<i>Agriopis leucophaearia</i> (Denis & Schiffermüller, 1775)	1, 4, 6
176.	<i>Agriopis marginaria</i> (Fabricius, 1776)	3, 4, 5, 6, 7
177.	<i>Alcis repandata</i> (Linnaeus, 1758)	1
178.	<i>Alsophila aescularia</i> (Denis & Schiffermüller, 1775)	1
179.	<i>Ascotis selenaria</i> (Denis & Schiffermüller, 1775)	6
180.	<i>Aspitates ochrearia</i> (Rossi, 1794)	2, 3, 4, 5, 6
181.	<i>Campaea honoraria</i> (Denis & Schiffermüller, 1775)	1, 3, 4, 5, 7
182.	<i>Campaea margaritaria</i> (Linnaeus, 1761)	3
183.	<i>Camptogramma bilineata</i> (Linnaeus, 1758)	1, 5
184.	<i>Catarhoe rubidata</i> (Denis & Schiffermüller, 1775)	1, 4, 5
185.	<i>Chemerina caliginearia</i> (Rambur, 1833)	3, 5, 6, 7
186.	<i>Chesias capriata</i> Prout, 1904	5
187.	<i>Chiasmia clathrata</i> (Linnaeus, 1758)	3, 6
188.	<i>Chlorissa cloraria</i> (Hübner, 1813)	3
189.	<i>Chloroclystis v-ata</i> (Haworth, 1809)	3, 4
190.	<i>Coenoteophria ablutaria</i> (Boisduval, 1840)	1, 3, 4, 5, 6, 7
191.	<i>Colotois pennaria</i> (Linnaeus, 1761)	3
192.	<i>Costaconvexa polygrammata</i> (Borkhausen, 1794)	3
193.	<i>Crocallis elinguar</i> (Linnaeus, 1758)	1, 4, 5
194.	<i>Cyclophora porata</i> (Linnaeus, 1767)	1, 7
195.	<i>Cyclophora pupillaria</i> (Hübner, 1799)	1, 3, 4, 5, 6, 7
196.	<i>Cyclophora ruficiliaria</i> (Herrich-Schäffer, 1855)*	3
197.	<i>Cyclophora suppunctaria</i> (Zeller, 1847)*	2, 6
198.	<i>Dyscia innocentaria</i> (Christoph, 1885)	2, 3, 4, 5, 6
199.	<i>Earophila badiata</i> (Denis & Schiffermüller, 1775)	3
200.	<i>Epirrhoe alternata</i> (Muller, 1764)	1, 3, 4, 5
201.	<i>Epirrita dilutata</i> (Denis & Schiffermüller, 1775)*	1
202.	<i>Eupithecia centaureata</i> (Denis & Schiffermüller, 1775)	1, 3, 5, 6
203.	<i>Eupithecia cocciferata</i> Millièr, 1864*	3

	Genus and species	Locality
204.	<i>Eupithecia ericeata</i> (Rambur, 1833)*	5, 6
205.	<i>Eupithecia gemellata</i> Herrich-Schäffer, 1861*	3, 5, 7
206.	<i>Eupithecia oxycedrata</i> (Rambur, 1833)*	2, 3, 5, 6
207.	<i>Eupithecia semigraphata</i> Bruand, 1850*	2, 3, 5, 6
208.	<i>Eupithecia ultimaria</i> Boisduval, 1840*	6
209.	<i>Gnophos sartata</i> Treitschke, 1827	4, 5, 6, 7
210.	<i>Gymnoscelis rufifasciata</i> (Haworth, 1809)	1, 2, 3, 5, 6, 7
211.	<i>Heliomata glarearia</i> (Denis & Schiffermüller, 1775)	3, 5, 6
212.	<i>Horisme vitalbata</i> (Denis & Schiffermüller, 1775)	1, 3, 4, 5, 7
213.	<i>Hypomecis punctinalis</i> (Scopoli, 1763)	3
214.	<i>Idaea albitorquata</i> (Püngeler, 1909)*	3
215.	<i>Idaea aversata</i> (Linnaeus, 1758)*	1, 3, 4, 5, 6, 7
216.	<i>Idaea circuitaria</i> (Hübner, 1819)	3, 4, 5, 6
217.	<i>Idaea degeneraria</i> (Hübner, 1799)	1, 3, 4, 5, 6, 7
218.	<i>Idaea distinctaria</i> (Boisduval, 1840)*	1, 3, 5, 6
219.	<i>Idaea filicata</i> (Hübner, 1799)	1, 3, 5, 6, 7
220.	<i>Idaea infirmaria</i> (Rambur, 1833)*	1, 3, 5, 6
221.	<i>Idaea leipnitz</i> Hausmann, 2004	3, 6
222.	<i>Idaea obsoletaria</i> (Rambur, 1833)*	1, 3, 6
223.	<i>Idaea ochrata</i> (Scopoli, 1763)	3, 5, 6
224.	<i>Idaea ostrinaria</i> (Hübner, 1813)	3, 5, 6
225.	<i>Idaea politaria</i> (Hübner, 1799)*	1
226.	<i>Idaea rubraria</i> (Staudinger, 1901)*	3
227.	<i>Idaea rusticata</i> (Denis & Schiffermüller, 1775)*	1, 2, 3, 4, 5
228.	<i>Idaea seriata</i> (Schrank, 1802)*	1, 2, 3
229.	<i>Idaea serpentata</i> (Hufnagel, 1767)*	3
230.	<i>Idaea straminata</i> (Borkhausen, 1794)*	5
231.	<i>Idaea subsericeata</i> (Haworth, 1809)*	1, 2, 3, 5, 6
232.	<i>Isturgia arenacearia</i> (Denis & Schiffermüller, 1775)	1, 2, 3, 5, 6
233.	<i>Larentia malvata</i> (Rambur, 1833)	2
234.	<i>Lycia hirtaria</i> (Clerck, 1759)	3, 5
235.	<i>Macaria alternata</i> (Denis & Schiffermüller, 1775)	1
236.	<i>Menophra abruptaria</i> (Thunberg, 1792)	1, 2, 3, 4, 5, 6, 7

	Genus and species	Locality
237.	<i>Microloxia herbaria</i> (Hübner, 1813)	1, 2, 3, 4, 5, 6
238.	<i>Nychiodes dalmatina</i> Wagner, 1909	3, 4, 5, 7
239.	<i>Nychiodes obscuraria</i> (de Villers, 1789)	1, 5
240.	<i>Nyctosea obstipata</i> (Fabricius, 1794)	3, 5
241.	<i>Opisthograptis luteolata</i> (Linnaeus, 1758)	1, 2, 3, 4, 5
242.	<i>Pachynemia hippocastanaria</i> (Hübner, 1799)	1, 3, 4, 5, 6, 7
243.	<i>Pachynemia tibiaria</i> (Rambur, 1829)	6, 7
244.	<i>Pareulype berberata</i> (Denis & Schiffermüller, 1775)	3
245.	<i>Pasiphila rectangulata</i> (Linnaeus, 1758)	3, 5
246.	<i>Pennithera firmata</i> (Hübner, 1822)	3
247.	<i>Peribatodes correptaria</i> (Zeller, 1847)	3, 7
248.	<i>Peribatodes rhomboidaria</i> (Denis & Schiffermüller, 1775)	1, 3, 4, 5, 6, 7
249.	<i>Peribatodes umbraria</i> (Hübner, 1809)	1, 2, 3, 5, 6
250.	<i>Perizoma flavofasciata</i> (Thunberg, 1792)	3, 5
251.	<i>Phaiogramma etruscaria</i> (Zeller, 1849)	1, 3, 4, 5
252.	<i>Rhodometra sacraria</i> (Linnaeus, 1767)	3, 5
253.	<i>Rhodostrophia calabra</i> (Petagna, 1786)	4, 6
254.	<i>Rhodostrophia vibicaria</i> (Clerck, 1759)	3
255.	<i>Rhoptria asperaria</i> (Hübner, 1817)	1, 3, 4, 5, 6, 7
256.	<i>Scopula corivalaria</i> (Kretschmar, 1862)*	6
257.	<i>Scopula imitaria</i> (Hübner, 1799)*	1, 3, 4, 5, 7
258.	<i>Scopula marginepunctata</i> (Goeze, 1781)*	1, 2, 3, 4, 5, 6
259.	<i>Scopula nigropunctata</i> (Hufnagel, 1767)*	3
260.	<i>Scopula ornata</i> (Scopoli, 1763)	1, 2, 3, 4, 5, 6, 7
261.	<i>Scopula rubiginata</i> (Hufnagel, 1767)	1, 2, 3, 5, 6
262.	<i>Synopsis sociaria</i> (Hübner, 1799)	3
263.	<i>Tephronia theophilaria</i> Hausmann, 2019*	3, 5, 6
264.	<i>Thetidia smaragdaria</i> (Fabricius, 1787)	3, 4, 5
265.	<i>Timandra comae</i> Schmidt, 1931	2, 4, 5
266.	<i>Xanthorhoe ferrugata</i> (Clerck, 1759)	5
267.	<i>Xanthorhoe fluctuata</i> (Linnaeus, 1758)	1, 3
268.	<i>Xanthorhoe oxybiata</i> (Millière, 1872)	3, 4
269.	<i>Xenochlorodes olympiaria</i> (Herrich-Schäffer, 1852)	4, 5, 6, 7

	Genus and species	Locality
	Erebidae	
270.	<i>Amata phegea</i> (Linnaeus, 1758)	1, 3, 5, 6
271.	<i>Araeopteron ecphaea</i> Hampson, 1914	4, 5
272.	<i>Arctia villica</i> (Linnaeus, 1758)	3, 5, 7
273.	<i>Catephia alchymista</i> (Denis & Schiffermüller, 1775)	3, 5
274.	<i>Catocala coniuncta</i> (Esper, 1787)	1, 4, 5
275.	<i>Catocala conversa</i> (Esper, 1783)	2
276.	<i>Catocala nymphaea</i> (Esper, 1787)	3, 4
277.	<i>Catocala nymphagoga</i> (Esper, 1787)	1, 3, 4, 5, 6
278.	<i>Cymbalophora pudica</i> (Esper, 1785)	1, 3, 4, 5, 6, 7
279.	<i>Diacrisia purpurata</i> (Linnaeus, 1758)	5
280.	<i>Diaphora mendica</i> (Clerck, 1759)	3, 5, 7
281.	<i>Dysauxes ancilla</i> (Linnaeus, 1767)	1, 3, 4, 5
282.	<i>Dysauxes famula</i> (Freyer, 1836)	1, 3, 4, 5, 6, 7
283.	<i>Dysgonia algira</i> (Linnaeus, 1767)	1, 3, 4, 5, 6, 7
284.	<i>Eilema caniola</i> (Hübner, 1808)	1, 2, 3, 4, 5, 6, 7
285.	<i>Eilema complana</i> (Linnaeus, 1758)*	5, 7
286.	<i>Eilema depressa</i> (Esper, 1787)	1, 3, 5, 6, 7
287.	<i>Eilema lurideola</i> (Zincken, 1817)*	3
288.	<i>Eilema sororcula</i> (Hufnagel, 1766)	1, 2, 3, 4, 5
289.	<i>Eublemma ostrina</i> (Hübner, 1808)	1, 3, 5, 7
290.	<i>Eublemma parva</i> (Hübner, 1808)	1, 3, 4, 5, 6
291.	<i>Eublemma purpurina</i> (Denis & Schiffermüller, 1775)	2, 3, 5, 7
292.	<i>Eublemma viridula</i> (Guenée, 1841)	1, 2, 3, 4, 5, 6, 7
293.	<i>Euplagia quadripunctaria</i> (Poda, 1761)	1, 3, 4
294.	<i>Grammodes stolidia</i> (Fabricius, 1775)	5
295.	<i>Hypena lividalis</i> (Hübner, 1796)	2
296.	<i>Hypena proboscidalis</i> (Linnaeus, 1758)	5
297.	<i>Laspeyria flexula</i> (Denis & Schiffermüller, 1775)	1, 3, 5
298.	<i>Lithosia quadra</i> (Linnaeus, 1758)	1, 3, 5
299.	<i>Lygephila cracca</i> (Denis & Schiffermüller, 1775)	1, 3, 4, 5, 7
300.	<i>Lymantria dispar</i> (Linnaeus, 1758)	1, 3, 6, 7
301.	<i>Metachrostis dardouini</i> (Boisduval, 1840)	1

	Genus and species	Locality
302.	<i>Metachrostis velox</i> (Hübner, 1813)	1, 3, 4, 5, 6, 7
303.	<i>Minucia lunaris</i> (Denis & Schiffermüller, 1775)	3, 7
304.	<i>Ocneria rubea</i> (Denis & Schiffermüller, 1775)	1, 3, 4, 5, 6, 7
305.	<i>Odice suava</i> (Hübner, 1813)	4, 5, 6
306.	<i>Ophiura tirhaca</i> (Cramer, 1773)	6
307.	<i>Pechipogo plumigeralis</i> Hübner, 1825	1, 3, 4, 5, 7
308.	<i>Phragmatobia fuliginosa</i> (Linnaeus, 1758)	1, 3, 5, 6, 7
309.	<i>Polypogon tentacularia</i> (Linnaeus, 1758)	5
310.	<i>Rhyparia purpurata</i> (Linnaeus, 1758)	7
311.	<i>Rivula sericealis</i> (Scopoli, 1763)	2
312.	<i>Schrankia costaestrigalis</i> (Stephens, 1834)	3, 6
313.	<i>Spilosoma lubricipeda</i> (Linnaeus, 1758)	5
314.	<i>Zebeeba falsalis</i> (Herrich-Schäffer, 1839)	1, 2, 3, 4, 5, 6, 7
	Euteliidae	
315.	<i>Eutelia adalatrix</i> (Hübner, 1813)	1, 2, 3, 4, 5, 6, 7
	Noctuidae	
316.	<i>Abrostola asclepiadis</i> (Denis & Schiffermüller, 1775)*	5
317.	<i>Acontia lucida</i> (Hufnagel, 1766)	1, 2, 3, 5
318.	<i>Acontia trabealis</i> (Scopoli, 1763)	1, 2, 3, 5, 6
319.	<i>Acronicta psi</i> (Linnaeus, 1758)*	3, 5, 6
320.	<i>Acronicta rumicis</i> (Linnaeus, 1758)	1, 3, 5, 6
321.	<i>Aedia leucomelas</i> (Linnaeus, 1758)	1, 2, 3, 5
322.	<i>Agrochola circellaris</i> (Hufnagel, 1766)	5
323.	<i>Agrochola lychnidis</i> (Denis & Schiffermüller, 1775)	1, 3, 5
324.	<i>Agrotis bigramma</i> (Esper, 1790)	3
325.	<i>Agrotis exclamatoris</i> (Linnaeus, 1758)	2, 5
326.	<i>Agrotis ipsilon</i> (Hufnagel, 1766)	1, 3, 4, 5, 6, 7
327.	<i>Agrotis puta</i> (Hübner, 1803)	1, 2, 3, 4, 5, 6, 7
328.	<i>Agrotis segetum</i> (Denis & Schiffermüller, 1775)	2, 3, 4, 5, 6
329.	<i>Allophyes oxyacanthae</i> (Linnaeus, 1758)	1, 4, 5
330.	<i>Ammoconia caecimacula</i> (Denis & Schiffermüller, 1775)	5
331.	<i>Ammoconia senex</i> (Geyer, 1828)	5
332.	<i>Anarta trifolii</i> (Hufnagel, 1766)	1, 2, 3, 4, 5, 7

	Genus and species	Locality
333.	<i>Apamea monoglyphica</i> (Hufnagel, 1766)	2
334.	<i>Aporophyla australis</i> (Boisduval, 1829)	3, 4, 5, 6
335.	<i>Aporophyla canescens</i> (Duponchel, 1826)	3, 5, 6
336.	<i>Aporophyla nigra</i> (Haworth, 1809)	3, 5, 6
337.	<i>Athetis hospes</i> (Freyer, 1831)	3, 4, 5
338.	<i>Autographa gamma</i> (Linnaeus, 1758)	1, 2, 3, 4, 5, 6, 7
339.	<i>Axylia putris</i> (Linnaeus, 1761)	3
340.	<i>Calophasia lunula</i> (Hufnagel, 1766)	3
341.	<i>Calophasia platyptera</i> (Esper, 1788)*	5
342.	<i>Caradrina clavipalpis</i> (Scopoli, 1763)*	2
343.	<i>Caradrina flavirena</i> Guenée, 1852*	3
344.	<i>Caradrina selini</i> Boisduval, 1840*	5
345.	<i>Caradrina terrea</i> Freyer, 1840*	5
346.	<i>Cerastis rubricosa</i> (Denis & Schiffermüller, 1775)	3, 4, 7
347.	<i>Charanyca trigrammica</i> (Hufnagel, 1766)	5
348.	<i>Chloantha hyperici</i> (Denis & Schiffermüller, 1775)	1, 2, 3, 5, 6
349.	<i>Chrysodeixis chalcites</i> (Esper, 1789)	1
350.	<i>Cleoceris scoriacea</i> (Esper, 1789)	7
351.	<i>Conisania luteago</i> (Denis & Schiffermüller, 1775)	1, 3, 4, 5
352.	<i>Conistra erythrocephala</i> (Denis & Schiffermüller, 1775)	3
353.	<i>Conistra rubiginea</i> (Denis & Schiffermüller, 1775)	1
354.	<i>Conistra vaccinii</i> (Linnaeus, 1761)	1, 2
355.	<i>Cosmia affinis</i> (Linnaeus, 1767)	2
356.	<i>Craniophora ligustri</i> (Denis & Schiffermüller, 1775)	1, 3, 4, 5, 6, 7
357.	<i>Cryphia algae</i> (Fabricius, 1775)*	1, 2, 3
358.	<i>Cryphia ochsi</i> (Boursin, 1940)*	1, 2, 3, 5, 6
359.	<i>Deltote pygarga</i> (Hufnagel, 1766)	6
360.	<i>Diloba caeruleocephala</i> (Linnaeus, 1758)	5
361.	<i>Dryobota labecula</i> (Esper, 1788)	5
362.	<i>Dryobotodes carbonis</i> Wagner, 1931*	5
363.	<i>Dryobotodes eremita</i> (Fabricius, 1775)?	3, 5
364.	<i>Dryobotodes monochroma</i> (Esper, 1790)	4, 5, 7
365.	<i>Dryobotodes tenebrosa</i> (Esper, 1789)	4, 5, 6

	Genus and species	Locality
366.	<i>Dypterygia scabriuscula</i> (Linnaeus, 1758)	1
367.	<i>Egira conspicillaris</i> (Linnaeus, 1758)	3
368.	<i>Emmelia trabealis</i> (Scopoli, 1763)	2
369.	<i>Episema glaucina</i> (Esper, 1789)	3, 4, 5, 6
370.	<i>Euxoa temera</i> (Hübner, 1808)	1, 5
371.	<i>Griposia aprilina</i> (Linnaeus, 1758)	5
372.	<i>Hadena compta</i> (Denis & Schiffermüller, 1775)	3, 5, 7
373.	<i>Hadena confusa</i> (Hufnagel, 1766)	6
374.	<i>Hadena perplexa</i> (Denis & Schiffermüller, 1775)	1, 3, 4, 5
375.	<i>Hecatera bicolorata</i> (Hufnagel, 1766)	3, 5
376.	<i>Helicoverpa armigera</i> (Hübner, 1808)	2, 5
377.	<i>Heliothis peltigera</i> (Denis & Schiffermüller, 1775)	1, 4, 5
378.	<i>Heliothis virescens</i> (Hufnagel, 1766)	1, 3, 4, 5, 6
379.	<i>Hoplodrina ambigua</i> (Denis & Schiffermüller, 1775)	2
380.	<i>Hoplodrina blanda</i> (Denis & Schiffermüller, 1775)	3, 6
381.	<i>Jodia croceago</i> (Denis & Schiffermüller, 1775)	3
382.	<i>Lacanobia oleracea</i> (Linnaeus, 1758)	3, 4, 6
383.	<i>Leucania putrescens</i> (Hübner, 1824)	1, 2, 3, 4, 5, 6, 7
384.	<i>Lithophane lapidea</i> (Hübner, 1808)	1, 3, 5, 6
385.	<i>Luperina dumerilii</i> (Duponchel, 1826)	1, 2, 3, 4, 5, 7
386.	<i>Mamestra brassicae</i> (Linnaeus, 1758)	3, 5, 6
387.	<i>Mesapamea secalella</i> Remm, 1983*	2
388.	<i>Mesapamea secalis</i> (Linnaeus, 1758)*	3, 4, 5, 6
389.	<i>Mesoligia furuncula</i> (Denis & Schiffermüller, 1775)	2, 3, 6
390.	<i>Mniotype solieri</i> (Boisduval, 1829)	2, 3, 4
391.	<i>Mythimna albipuncta</i> (Denis & Schiffermüller, 1775)	5
392.	<i>Mythimna ferrago</i> (Fabricius, 1787)	1, 2, 3, 4, 5, 7
393.	<i>Mythimna l-album</i> (Linnaeus, 1767)	3, 4, 5
394.	<i>Mythimna riparia</i> (Rambur, 1829)*	1, 3, 4
395.	<i>Mythimna sicula</i> (Treitschke, 1835)*	1, 2, 3, 4, 5, 6, 7
396.	<i>Mythimna unipuncta</i> (Haworth, 1809)	2, 3, 5
397.	<i>Mythimna vitellina</i> (Hübner, 1808)	1, 3, 4, 5, 6, 7
398.	<i>Noctua comes</i> Hübner, 1813	1, 3, 4, 5, 6, 7

	Genus and species	Locality
399.	<i>Noctua fimbriata</i> (Schreber, 1759)*	1, 3, 4, 5, 6, 7
400.	<i>Noctua interjecta</i> Hübner, 1803	1, 2, 3, 4, 5, 6
401.	<i>Noctua janthina</i> Denis & Schiffermüller, 1775*	1, 3, 4, 5, 6, 7
402.	<i>Noctua pronuba</i> (Linnaeus, 1758)	1, 3, 4, 5, 6, 7
403.	<i>Noctua tirrenica</i> Biebinger, Speidel & Hanigk, 1983*	2, 4, 6
404.	<i>Nyctobrya amasina</i> Draudt, 1931*	3, 5, 6
405.	<i>Ochropleura leucogaster</i> (Freyer, 1831)	1, 2, 5
406.	<i>Ochropleura plecta</i> (Linnaeus, 1761)	3
407.	<i>Orthosia cerasi</i> (Fabricius, 1775)	1
408.	<i>Orthosia cruda</i> (Denis & Schiffermüller, 1775)	1, 3
409.	<i>Orthosia gothica</i> (Linnaeus, 1758)	4, 7
410.	<i>Panolis flammea</i> (Denis & Schiffermüller, 1775)	1
411.	<i>Peridroma saucia</i> (Hübner, 1808)	1, 5
412.	<i>Perigrapha rorida</i> Frivaldszky, 1835	6
413.	<i>Phlogophora meticulosa</i> (Linnaeus, 1758)	2, 3, 4, 5, 6
414.	<i>Phyllophila oblitterata</i> (Rambur, 1833)	5
415.	<i>Polymixis serpentina</i> (Treitschke, 1825)	3, 4, 5, 6, 7
416.	<i>Polyphaenis sericata</i> (Esper, 1787)	1, 3, 4, 6
417.	<i>Rhizedra lutosus</i> (Hübner, 1803)	7
418.	<i>Sesamia cretica</i> Lederer, 1857	3
419.	<i>Sideridis rivularis</i> (Fabricius, 1775)	1
420.	<i>Simyra albovenosa</i> (Goeze, 1781)	3, 5
421.	<i>Spodoptera exigua</i> (Hübner, 1808)	1, 2, 3, 5, 7
422.	<i>Thalophila matura</i> (Hufnagel, 1766)	1, 3, 4, 5, 6, 7
423.	<i>Trichoplusia ni</i> (Hübner, 1803)	2, 3, 7
424.	<i>Trigonophora flammea</i> (Esper, 1785)	5
425.	<i>Tyta luctuosa</i> (Denis & Schiffermüller, 1775)	1, 2, 3, 4, 5, 6
426.	<i>Valeria oleagina</i> (Denis & Schiffermüller, 1775)	1, 3, 4, 7
427.	<i>Xanthia gilvago</i> (Denis & Schiffermüller, 1775)	5
428.	<i>Xanthia ruticilla</i> (Esper, 1791)	1, 3, 4, 5, 6, 7
429.	<i>Xanthodes albago</i> (Fabricius, 1794)	2
430.	<i>Xestia castanea</i> (Esper, 1798)	3, 5
431.	<i>Xestia c-nigrum</i> (Linnaeus, 1758)	1, 2, 3, 4, 5, 6, 7

	Genus and species	Locality
432.	<i>Xestia xanthographa</i> (Denis & Schiffermüller, 1775)	1, 3, 5, 7
433.	<i>Xylocampa areola</i> (Esper, 1789)	4
	Nolidae	
434.	<i>Meganola albula</i> (Denis & Schiffermüller, 1775)	3, 5
435.	<i>Meganola strigula</i> (Denis & Schiffermüller, 1775)	1
436.	<i>Nola aerugula</i> (Hübner, 1793)	3
437.	<i>Nola chlamitulalis</i> (Hübner, 1813)*	3, 6
438.	<i>Nycteola asiatica</i> (Krulikovsky, 1904)*	3, 6
439.	<i>Nycteola columbana</i> (Turner, 1925)*	1, 3, 7
440.	<i>Nycteola siculana</i> (Fuchs, 1899)*	3
	Notodontidae	
441.	<i>Dicranura ulmi</i> (Denis & Schiffermüller, 1775)	6
442.	<i>Drymonia ruficornis</i> (Hufnagel, 1766)	3
443.	<i>Harpyia milhauseri</i> (Fabricius, 1775)	1, 3, 5
444.	<i>Peridea anceps</i> (Goeze, 1781)	3
445.	<i>Spatalia argentina</i> (Denis & Schiffermüller, 1775)	1, 3, 5
446.	<i>Thaumetopoea processionea</i> (Linnaeus, 1758)	1, 3, 5, 6, 7

RAZNOLIKOST NOČNIH METULJEV (LEPIDOPTERA: HETEROCERA) POMEMBNE
POKRAJINE DONJI KAMENJAK IN MEDULINSKI ARHIPELAG, ISTRA, HRVAŠKA

Toni KOREN

Association Hyla, Zagreb, Croatia, Association Hyla, Zagreb, Croatia
e-mail: toni.koren@hhdhyla.hr

POVZETEK

V letu 2021 je bila v enoletnem študijskem obdobju raziskana pestrost nočnih metuljev Pomembne pokrajine Donji Kamenjak in medulinski arhipelag. Skupaj s podatki, zbranimi na več terenskih izletih v preteklih letih, je bilo na območju doslej zabeleženih 446 vrst nočnih metuljev. Številne zabeležene vrste spadajo med redko zabeležene vrste nočnih metuljev na Hrvaškem, nekatere pa predstavljajo šele drugo ali tretjo najdbo za državo. Ena vrsta, Eupithecia ultimaria Boisduval, 1840, je prvič zabeležena na območju Hrvaške. Ugotovljene so bile tri glavne nevarnosti za pestrost nočnih metuljev, naravno nasledstvo zaradi pomanjkanja redne paše, obsežna mreža poti in cest, ki vodijo do drobljenja habitata ter visoka obremenitev z vozili v poletnih mesecih, ki povzroča dvig karbonatnega prahu od makadamskih cest na okoliških traviščih in rastlinju.

Ključne besede: kraški travniki, makija, favnistika, svetlobne pasti, Natura 2000

REFERENCES

- Anonymous (1992):** Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Official Journal of the European Communities L, 7-50.
- Anonymous (1996):** Assembly of the County of Istria owing to landscape and natural and cultural values.
- Anonymous (2002):** Assembly of the County of Istria owing to landscape and natural and cultural values.
- Anonymous (2009):** Pravilnik o proglašavanju divljih svojti zaštićenim i strogo zaštićenim. Narodne novine 2009.
- Anonymous (2015):** Uredba o izmjenama Uredbe o ekološkoj mreži. Narodne novine 2015.
- Bennett, V.J. (2017):** Effects of Road Density and Pattern on the Conservation of Species and Biodiversity. Curr. Landscape Ecol. Rep., 2, 1-11. <https://doi.org/10.1007/s40823-017-0020-6>
- Carić, H. & M. Jakelić (2018):** Informirano upravljanje posjećivanjem u zaštićenim područjima. Prostor, 26, 146-155.
- de Jong, Y., M. Verbeek, V. Michelsen, P. de P. Bjørn, W. Los, F. Steeman, N. Bailly, C. Basire, P. Chylarecki, E. Stloukal, G. Hagedorn, F. Wetzler, F. Glöckler, A. Kroupa, G. Korb, A. Hoffmann, C. Häuser, A. Kohlbecker, A. Müller, A. Güntsch, P. Stoev & L. Penev (2014):** Fauna Europaea - all European animal species on the web. Biodiversity Data Journal, 2, 1-35. <https://doi.org/10.3897/BDJ.2.e4034>.
- Fibiger, M. (1990):** Noctuinae I. - Noctuidae Europaeae. Entomological Press, Sorø.
- Fibiger, M. (1993):** Noctuinae II. - Noctuidae Europaeae, Noctuidae Europaeae. Entomological Press, Sorø.
- Fibiger, M. (1997):** Noctuinae III. - Noctuidae Europaeae. Entomological Press, Sorø.
- Fibiger, M., H. Hacker & M. Fibiger (2007):** Amphipyrinae, Condicinae, Eriopinae, Xyleninae - Noctuidae Europaeae, Noctuidae Europaeae. Entomological Press, Sorø.
- Fibiger, M., L. Ronkay, A. Steiner & A. Zilli (2009):** Pantheinae, Dilobinae, Acronictinae, Eustrotiinae, Nolinae, Bagisarinae, Acontiinae, Metoponiinae, Heliiothinae and Bryophilinae - Noctuidae Europaeae. Entomological Press, Sorø.
- Fibiger, M., L. Ronkay, J.L. Yela & A. Zilli (2010):** Rivulinae, Boletobiinae, Hypenodinae, Araeopter-oninae, Eublemminae, Herminiinae, Hypeninae, Phytometrinae, Euteliinae, and Micronoctuidae including Supplement to Volumes 1-11. - Noctuidae Europaeae. Entomological Press, Sorø.
- Gaedike, R. (2019):** Microlepidoptera of Europe - Tineidae II (Myrmecozelinae, Perissomasticinae, Tineinae, Hieroxestinae, Teichobiinae and Stathmopoli-tinae). BRILL, Leiden.
- Galvagni, E. (1909):** Die zoologische Reise des Naturwissenschaftlichen Vereines nach Dalmatien im April 1906. 13. Lepidoptera (Beiträge zur Kenntnis der Lepidopterenfauna der Adriatischen Inseln). Sonder-Abdruck aus den Mitteilungen des Naturwis-senschaftlichen Vereines an der Universität Wien., 7, 154-254.
- Galvagni, E. (1921):** Nachtrag zur Kenntnis der Schmetterlingsfauna Lussins. Verhandlungen zoolo-gisch-botanischen Gesellschaft in Wien, 72, 84-89.
- Goater, B., M. Nuss & W. Speidel (2005):** Micro-lepidoptera of Europe - Pyraloidea I. Apollo Books, Stenstrup, Denmark.
- Goater, B., L. Ronkay & M. Fibiger (2003):** Cato-calinae and Plusinae - Noctuidae Europaeae. Entomo-logical Press, Sorø.
- Gumhalter, D. (2019):** A review of the article "New findings of case-bearing moth species of *Goniograma* and *Coleophora* genera from the Balkans (Lepidop-tera: Coleophoridae)" by Richter & Pastorális (2015). Nat. Croat., 28, 181-183. <https://doi.org/10.20302/NC.2019.28.18>
- Gumhalter, D. (2021):** Confirmed occurrence and new records of *Sciota rhenella* (Zincken, 1818) (Lepi-doptera: Pyraloidea: Pyralidae) in Croatia. Nat. Croat., 30, 417-423. <https://doi.org/10.20302/NC.2021.30.27>
- Gumhalter, D. & M. Kučinić (2020):** First published records of *Catoptria acutangulellus* (HerrichSchäffer, 1847) (Lepidoptera: Crambidae) in Croatia after al-most a century. Nat. Croat., 29, 129-134. <https://doi.org/10.20302/NC.2020.29.12>
- Habeler, H. (2001):** Lepidopterologische Nach-richten aus der Steiermark, 18 - mit Funddaten von den Inseln Krk und Cres (Lepidoptera). Joannea Zoologie, 3, 29-36.
- Habeler, H. (2003):** Die Schmetterlinge der Adria-Insel Krk. Eine ökofaunistische Studie. Delta Druck, Verlag Heinz Peks, Graz.
- Hacker, H., Ronkay, L. & Hreblay, M. (2002):** Had-eninae I. - Noctuidae Europaeae. Entomological Press, Sorø.
- Hausmann, A. (2001):** Introduction to the series. Archiearinae, Oenochrominae, Geometrinae, Leiden., The Geometrid Moths of Europe. Apollo Books, Sten-strup.
- Hausmann, A. (2004):** Sterrhinae, The Geometrid Moths of Europe. Apollo Books, Stenstrup.
- Hausmann, A. & J. Viidalepp (2012):** Geometrid Moths of Europe, 3. Larentiinae I. Apollo Books, Sten-strup.
- Huemer, P. & O. Karsholt (1999):** Microlepidoptera of Europe - Gelechiidae I. Apollo Books, Stenstrup.
- Huemer, P. & O. Karsholt (Eds.) (2005):** Micro-lepidoptera of Europe - Gelechiidae II. Apollo Books, Stenstrup, Denmark.

- Huemer, P., M. Mutanen, K.M. Sefc & P.N.D. Hebert (2014):** Testing DNA Barcode Performance in 1000 Species of European Lepidoptera: Large Geographic Distances Have Small Genetic Impacts. *PLoS ONE*, 9, 21. <https://doi.org/10.1371/journal.pone.0115774>
- Huemer, P. & G. Tarmann (1991):** Westpaläarktische Gespinstmotten der Gattung *Kessleria* NOWICKI: Taxonomie, Ökologie, Verbreitung. *Mitteilungen der Münchner Entomologischen Gesellschaft*, 81, 5-110.
- Karisch, T. & M. Pinzari (2010):** *Cydia molybdana* (Constant, 1884) - a valid species (Lepidoptera: Tortricidae: Olethreutinae). *Beiträge zur Entomologie*, 60, 463-470. <https://doi.org/10.21248/contrib.entomol.60.2.463-470>
- Kristensen, N. P., M.J. Scoble & O. Karsholt (2007):** Lepidoptera phylogeny and systematics: the state of inventorying moth and butterfly diversity. *Zootaxa*, 1668(1), 699-747.
- Klimesch, J. (1942):** Über Microlepidopteren-Ausbeuten aus der Gegend von Zaton bei Gravosa (Süddalmatien). *Münchner Entomologischen Gesellschaft*, 32, 347-399.
- Koren, T. (2020):** Butterflies and moths (Insecta: Lepidoptera) of the Lokrum island, southern Dalmatia. *Nat. Croat.*, 29, 227-240.
- Koren, T. (2021a):** *Hydraecia osseola* (Staudiniger, 1882) (Noctuidae) and *Araeopteron ecphaea* Hampson, 1940 (Erebidae) new for the fauna of Croatia. *Entomologist's Record and Journal of Variation*, 133, 12-16.
- Koren, T. (2021b):** *Dioryctria robiniella* (Millière, 1865) (Lepidoptera: Pyralidae) is a member of fauna of Croatia. *Acta Entomologica Serbica*, 26, 26-29. <https://doi.org/10.5281/ZENODO.4551159>
- Koren, T. & Lj. Ladavac (2013):** Diversity of Macroheterocera (except fam. Noctuidae [sensu novo] and fam. Geometridae) of central Istria, Croatia. *Nat. Croat.*, 22, 73-94.
- Koren, T. & M. Martinović (2020):** A contribution to the knowledge of the moth diversity of Bosnia and Herzegovina. *The Entomologist's Record and Journal of Variation*, 132, 124-128.
- Koren, T., K. Vukotić & M. Črne (2015):** Diversity of the moth fauna (Lepidoptera: Heterocera) of a wetland forest: A case study from Motovun forest, Istria, Croatia. *Periodicum Biologorum*, 117, 399-414.
- Koren, T., D. Withrington, A. Štih & P. Gros (2018):** The butterflies of the Istria county (Istria, Croatia): A review of their distribution, status and conservation requirements (Lepidoptera, Rhopalocera). *Gortania*, 40, 95-114.
- Kučinić, M., B. Jalžić & D. Pelić (1998):** *Xylocampa areola* (Esper, 1789), *Eurois occulta* (Linnaeus, 1758) i *Euxoa decora* (Denis & Schiffermüller, 1775), new elements in the noctuid fauna (Insecta: Lepidoptera: Noctuidae) of Croatia. *Nat. Croat.*, 7, 213-226.
- Kučinić, M., M. Matešić, T. Koren, A. Mrnjavčić Vojvoda, M. Vajdić, D. Pelić Fixa, V. Bukvić & F. Perović (2014):** First check list of the subfamily Arctiinae (Lepidoptera, Erebidae) in Croatia, with the finding of *Rhyarioides metelkana* (Lederer, 1861), new species in Croatian fauna from the valley of the Neretva River. *Nat. Croat.*, 23, 67-87.
- Lepiforum e.V. (2021):** Lepiforum e.V. Bestimmung von Schmetterlingen und ihren Präimaginalstadien [WWW Document]. URL <https://lepiforum.org/> (accessed 11.4.21).
- Leraut, P. (2006):** Saturnids, Lasiocampids, Hawkmoths, Tiger Moths, Moths of Europe. NAP Editions, Verrières-le Buisson.
- Leraut, P. (2009):** Moths of Europe, Volume 2: Geometrid Moths. NAP Editions, Verrières-le Buisson.
- Leraut, P. (2012):** Moths of Europe, Volume 3: Zygaenids, Pyralids 1 and Brachodids. NAP Editions, Verrières-le Buisson.
- Ljubičić, I. & S. Bogdanović (2014):** Karta staništa i smjernica za održivim upravljanjem staništima na području Značajnog krajobraza Donji Kamenjak i Medulinski arhipelag (final). Sveučilište u Zagrebu, Agronomski fakultet, Zavod za poljoprivrednu botaniku, Zagreb.
- Ljubičić, I., H. Paulik & S. Bogdanović (2020):** Habitat mapping of Protected Landscape of Donji Kamenjak, Istria (Croatia). *J. cent. eur. agric.*, 21, 676-685. <https://doi.org/10.5513/JCEA01/21.3.2697>
- Macek, J., J. Procházka & L. Traxler (2012):** Motýli a housenky střední Evropy. Noční motýli III., 1st ed, Motýli a housenky střední Evropy. Academia, Praha.
- Mann, J. (1857):** Verzeichnis der im Jahre 1853 in der Gegend von Fiume gesammelten Schmetterlinge. *Wiener entomologische Monatschrift*, 1, 139-189.
- Mann, J. (1869):** Lepidopteren gesammelt während dreier Reisen nach Dalmatien in den Jahren 1850, 1862 und 1868. *Verhandlungen zoologisch-botanischen Gesellschaft in Wien*, 19: 371-388.
- Mihoci, I. (2012):** Raznolikost grbica (Lepidoptera, Geometridae) Hrvatske i ekološka uvjetovanost njihove visinske rasprostranjenosti (PhD). University of Zagreb, Faculty of Science, Zagreb.
- Mironov, V. (2003):** Larentinae II. (Perizomini and Eupitheciini), *The Geometrid Moths of Europe*. Brill, Stenstrup.
- Moog, D., P. Poschlod, S. Kahmen & K.-F. Schreiber (2002):** Comparison of species composition between different grassland management treatments after 25 years. *Applied Vegetation Science*, 5, 99-106. <https://doi.org/10.1111/j.1654-109X.2002.tb00539.x>
- Müller, B., S. Erlacher, A. Hausmann, H. Rajaei, P. Sihvonen & P. Skou (2019):** Ennominae II., *The Geometrid Moths of Europe*. Brill, Leiden.
- Nowacki, J. (1998):** The noctuida (Lepidoptera, Noctuidae) of Central Europe. František Slamka, Bratislava.

- Ozimec, R., M. Jakelić, H. Vidović, G. Kos & I. Sever (2016):** Studija nosivog kapaciteta značajnog krajobraza Donji Kamenjak i medulinski arhipelag. ADIPA - Društvo za istraživanje i očuvanje prirodoslovne raznolikosti Hrvatske, Zagreb.
- Paljar, I., Z. Kovač, T. Brajnović-Širola, G. Kuhar & B. Nefat (2009):** Prostorni plan područja posebnih obilježja Donji Kamenjak i Medulinski arhipelag. Službene novine Istarske županije 2, 68.
- Plant, C.W. & P. Jakšić (2018):** A provisional checklist and bibliography of the Pyraloidea of the Balkan Peninsula. *Atalanta*, 49, 219-263.
- Popović, M., N. Vasić, T. Koren, I. Burić, N. Živanović, D. Kulijer & A. Golubović (2020):** Biologer: an open platform for collecting biodiversity data. *Biodiversity Data Journal* 8.
- Prohaska, K. (1922):** Kleinschmetterlinge von Pola. *Zeitschrift des Österreichischen Entomologen Vereines*, 7, 32-33.
- Rákossy, L. (Ed.) (1996):** Die Noctuiden Rumäniens: (Lepidoptera Noctuidae), *Stapfia*. Land Oberösterreich, Linz.
- Razowski, J. (2003):** Tortricidae (Lepidoptera) of Europe, first ed, *Tortricidae (Lepidoptera) of Europe*. František Slamka, Bratislava.
- Rebel, H. (1904):** Studien über die Lepidopterenfauna der Balkanländer. II. Teil. Bosnien und Herzegowina. *Annalen des Naturhistorischen Museums in Wien*, 19, 97-377.
- Rebel, H. (1912):** Lepidopteren aus dem Gebiete des Monte Maggiore in Istrien. I. Nachtrag. *Jahresberichte Wiener entomologischer Verein*, 22, 227-240.
- Rebel, H. (1913a):** Zur Lepidopterenfauna der Brionischen Inseln. *Jahresb. Ent. Ver., Jahresbericht des Wiener Entomologischen Vereines*, 23, 217-222.
- Rebel, H. (1913b):** Lepidopteren aus dem Gebiete des Monte Maggiore in Istrien. II. Nachtrag. *Jahresbericht des Wiener Entomologen Vereines*, 23, 177-205.
- Rebel, H. (1914):** Über die Lepidopterenfauna von Brioni grande. *Jahresb. Ent. Ver. Wien.*, 24, 181-201.
- Rebel, H. (1919):** Zur Lepidopterenfauna Dalmatiens. *Verhandlungen zoologischen-botanischen Gesellschaft in Wien*, 69, 106-110.
- Rebel, H. (1924):** Lepidopteren aus dem Gebiete des Monte Maggiore in Istrien. III. Nachtrag. *Jahresber. Wien. ent. Ver.*, 30, 25-35.
- Richter, I. & G. Pastorális (2015):** New findings of case-bearing moth species of *Goniadoma* and *Coelophora* genera from the Balkans. *Microlepidoptera*. hu, 8, 29-42.
- Ronkay, L. & G. Ronkay (1994):** Cuculliinae I. - Noctuidae Europaeae. *Entomological Press*, Sorø.
- Ronkay, G. & L. Ronkay (1995):** Cuculliinae II. - Noctuidae Europaeae. *Entomological Press*, Sorø.
- Ronkay, L., J.L. Yela & M. Hreblay (2001):** Hadeninae II. - Noctuidae Europaeae. *Entomological Press*, Sorø.
- San Miguel, A. (2008):** Management of Natura 2000 habitats. 6220 *Pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea*.
- Schawerda, K. (1927):** Beitrag und Nachtrag zur Lepidopterenfauna der Dalmatischen Inseln, beziehungsweise der Insel Lussin. *Verhandlungen der Zoologisch-Botanischen Gesellschaft*, 77, 79-81.
- Schawerda, K. (1921):** Beiträge zur Lepidopterenfauna der kroatischen Küste und Neubeschreibungen. *Deutsche Entomologische Zeitschrift Iris*, 35, 111-138.
- Schawerda, K. (1920):** Lepidopteren-Ausbeute aus der Gegend von Lovrana und Monte Maggiore. *Zeitschrift des Österreichischen Entomologischen Vereines*, 5, 10-11, 20-21, 28, 36, 43.
- Schawerda, K. (1919):** Neue Formen aus meiner Sammlung. *Zeitschrift des Österreichischen Entomologischen Vereines*, 7, 67-68.
- Schwingschuss, L. & F. Wagner (1925):** Beitrag zur Macro-Lepidopteren-Fauna Süddalmatiens insbesondere der Umgebung Gravosa's. *Zeitschrift des Österreichischen Entomologischen Vereines*, 10-12, 53-71, 78-82, 116-119.
- Settele, J., O. Kudrna, A. Harpke, I. Kühn, C. Swaay, R. Verovnik, M. Warren, M. Wiemers, J. Hanspach, T. Hickler, E. Kühn, I. van Halder, K. Veling, A. Vliegert, I. Wynhoff & O. Schweiger (2008):** Climate Risk Atlas of European Butterflies. *Pensoft*. <https://doi.org/10.3897/biorisk.1>
- Skou, P. & P. Sihvonen (2015):** Ennominae I., The Geometrid Moths of Europe. *Brill*, Leiden.
- Slamka, F. (2006):** Pyraloidea of Europe (Lepidoptera). Volume 1. Identification, distribution, habitat, biology. Pyralinae, Galleriinae, Epipaschiinae, Cathariinae & Odontiinae, 1st ed. František Slamka, Bratislava.
- Slamka, F. (2008):** Pyraloidea of Europe (Lepidoptera). Volume 2. Identification, distribution, habitat, biology. Crambinae & Schoenobiinae, 1st ed. František Slamka, Bratislava.
- Slamka, F. (2013):** Pyraloidea of Europe (Lepidoptera). Volume 3. Identification, distribution, habitat, biology. Pyraustinae & Spilomelinae, 1st ed. František Slamka, Bratislava.
- Slamka, F. (2019):** Pyraloidea of Europe (Lepidoptera). Volume 4. Identification, distribution, habitat, biology. Phycitinae - Part 1, 1st ed. František Slamka, Bratislava.
- Speidel, W. & J. Asselbergs (2000):** The status of *Ocrisia* Ragonot, 1893, and notes on *Dioryctria* Zeller, 1846 (Lepidoptera: Pyralidae, Phycitinae). *Entomologische Zeitschrift*, 110, 144-146.
- Stauder, H. (1930):** Die Schmetterlingsfauna der illyro-adriatischen Festland- und Inselzone (Faunula Illyro-Adriatica). *Entomologischer Anzeiger*, 10, 9-10, 36-37, 52-57, 75-77, 105-108, 133-136, 153-155, 201-204, 249-252, 275-276, 294-297, 309-310, 351-352, 374-377, 436-437.

Stauder, H. (1914): Mikrolepidopteren des Triester Gebietes und aus inneristrien. Dtsch. ent. Z. iris, 28, 4-12.

Stauder, H. (1920): Die Schmetterlingsfauna der illyro-adriatischen Festland- und Inselzone [Faunula Illyro-Adriatica]. Zeitschrift für wissenschaftliche Insektenbiologie, 16, 16-23, 43-49, 101-108, 143-153, 166-176, 219-224.

Stauder, H. (1923a): Neue illyro-adriatische Lepidopteren-Formen (Noctuidae). Entomologischer Anzeiger Wien, 3, 43-44.

Stauder, H. (1923b): Die Schmetterlingsfauna der illyro-adriatischen Festland- und Inselzone (Faunula Illyro-Adriatica). Zeitschrift für wissenschaftliche Insektenbiologie Berlin, 18, 10-18, 58-68, 106-114, 187-202, 253-267, 317-327.

Stauder, H. (1925): Die Schmetterlingsfauna der illyro-adriatischen Festland- und Inselzone (Faunula Illyro-Adriatica). Zeitschrift für wissenschaftliche Insektenbiologie Berlin, 20, 191-226.

Stauder, H. (1926): Die Schmetterlingsfauna der illyro-adriatischen Festland- und Inselzone (Faunula Illyro-Adriatica). Zeitschrift für wissenschaftliche Insektenbiologie Berlin, 21, 179-190, 223-238.

Stauder, H. (1927): Die Schmetterlingsfauna der illyro-adriatischen Festland- und Inselzone (Faunula Illyro-Adriatica). Zeitschrift für wiss. Ins.-Biologie, 21, 30-45, 74-92.

Stauder, H. (1929): Die Schmetterlingsfauna der illyro-adriatischen Festland- und Inselzone (Faunula Illyro-Adriatica). Entomologischen Anzeiger, 9, 39-41, 53-58, 65-72, 88-94, 115-117, 131-137, 157-158, 177-178, 194-199, 213-218, 233-236, 251-252, 272-273, 292-293, 299-306, 318-325, 359-364, 379-384, 397-403, 420-423, 437-442.

Stauder, H. (1932): Die Schmetterlingsfauna der illyro-adriatischen Festland- und Inselzone [Faunula Illyro-Adriatica]. Entomologischen Anzeiger, 12, 35-39, 53-54, 71-72, 92, 131-132, 150-152, 200, 233-234, 256.

Stauder, H. (1933): Die Schmetterlingsfauna der illyro-adriatischen Festland- und Inselzone [Faunula Illyro-Adriatica]. Entomologischen Anzeiger, 13, 18-20.

Šumpich, J. & M. Konvička (2012): Moths and management of a grassland reserve: regular mowing and temporary abandonment support different species. Biologia, 67, 973-987. <https://doi.org/10.2478/s11756-012-0095-9>

van Swaay, C.A.M. (2002): The importance of calcareous grasslands for butterflies in Europe. Biological Conservation, 104, 315-318. [https://doi.org/10.1016/S0006-3207\(01\)00196-3](https://doi.org/10.1016/S0006-3207(01)00196-3)

Witt, T.J. (1987): Lepidopterologische Sammelergebnisse der Reisen Franz Daniels nach Istrien in den Jahren 1965 mit 1971 (Lepidoptera, Bombyces et Sphinges). Entomofauna, 8, 413-440.

Witt, T.J. & L. Ronkay (2011): Lymantriinae and Arctiinae including Phylogeny and check list of the quadrid Noctuoidea of Europe - Noctuidae Europaeae. Entomological Press, Sorø.

Zaninović, K. (Ed.) (2008): Klimatski atlas Hrvatske. Državni hidrometeorološki zavod, Zagreb.

Zilli, A., Ronkay, L. & M. Fibiger (2005): Apameini - Noctuidae Europaeae. Entomological Press, Sorø.