

NOTES ON *ZYGAENA* FABRICIUS, 1775 OF THE BALKAN PENINSULA (INSECTA, LEPIDOPTERA, ZYGAENIDAE)

Ana NAHIRNIĆ¹, Predrag JAKŠIĆ² & Gerhard M. TARMANN³

¹ Faculty of Biology, University of Belgrade, Studentski trg 16, 11 000 Belgrade, Serbia, e-mail: ananahirnic@gmail.com

² Faculty of Sciences, University of Niš, Višegradska 33, 18 000 Niš, Serbia

³ Tiroler Landesmuseen, Ferdinandeum, Naturwissenschaftliche Abteilung, Feldstrasse 11a, A-6020 Innsbruck, Austria

Abstract - New data on three species of *Zygaena* Fabricius, 1775 from Serbia and Montenegro are provided. *Z. (M.) cynarae* (Esper, 1789) is newly recorded for Montenegro and the central Balkans, while *Z. (Z.) nevadensis* Rambur, 1958 has been discovered in Serbia. On Kopaonik Mountain (Serbia), a 6-spotted population of *Z. (Z.) transalpina* (Esper, 1780) / *Z. (Z.) angelicae* Ochseneheimer, 1808 had been found which includes forms that are intermediate to the normally 5-spotted *Z. (Z.) angelicae herzegowinensis* Reiss, 1922 that is widely distributed in the Balkans.

KEY WORDS: *Zygaena*, Balkan Peninsula

Izvešček - PODATKI O RODU *ZYGAENA* FABRICIUS, 1775, NA BALKANSKEM POLOTOKU (INSECTA, LEPIDOPTERA, ZYGAENIDAE)

Navedeni so novi podatki o treh vrstah iz rodu *Zygaena* Fabricius, 1775, iz Srbije in Črne gore. *Z. (M.) cynarae* (Esper, 1789) je prvič zabeležena za Črno goro in osrednji Balkan, medtem ko je bila *Z. (Z.) nevadensis* Rambur, 1958, odkrita v Srbiji. Na gori Kopaonik (Srbija) je bila najdena populacija vrste *Z. (Z.) transalpina* (Esper, 1780) / *Z. (Z.) angelicae* Ochseneheimer, 1808, s šestimi pikami, ki vsebuje vmesne oblike s podvrsto *Z. (Z.) angelicae herzegowinensis* Reiss, 1922, ki ima običajno pet pik in je široko razširjena na Balkanu.

KLJUČNE BESEDE: *Zygaena*, Balkanski polotok

Introduction

While compiling data for an international project on the Zygaenidae of the Balkan Peninsula, some preliminary and unexpected results show that there is still a considerable lack of knowledge about the group in this region. Holik (1936-1939) published an extensive summary of the Zygaenidae of the Balkan Peninsula, based on the earlier literature and original material from many important museum collections of the time (e.g. those housed in Munich, Vienna, Budapest, Sarajevo, Ljubljana, Klagenfurt etc.). He was also in contact with the most important specialists such as B. Alberti, H. Rebel, H. Zerny, and with many private collectors (e.g. J. Hafner, J. Thurner, A. Winneguth, B. Zukowsky). However, during the past 70 years a lot of new informations accumulated, much of which is already published (e.g. Alberti, 1938, 1939, 1966; Burgermeister, 1964; Coutsis, 1988; Daniel, 1957, 1958, 1964; Daniel, Forster & Osthelder, 1951; Dutreix & Essayan, 1992; Hofmann, 2003; Jaksic, 1990, 2006; Rauch, 1977a, 1977b, 1981; Reiss, 1962; Reiss & Tremewan, 1962; Silbernagel, 1944; Thurner, 1938, 1967; Verity, 1939). More recent fieldwork has produced some surprising results which the present authors consider worth publishing, even though a lot of additional work is still necessary.

Material and methods

Adult samples were collected using an entomological net. The specimens were determined on the basis of wing-patterns following Naumann et al. (1999). Photos of specimens were taken using an Olympus SZX 10 stereo microscope with a special ring illumination (no ring flash!) and with a digital camera Olympus E 3. A series of shots were taken by starting with the focusing at the highest point of the specimen and by working down in focus layers. The final picture was compiled by the programme Helicon Focus 4.30 Pro and then cleaned and the background generalized with the programmes Adobe Photoshop Lightroom and Adobe Photoshop CS 4. Distribution maps were plotted using BioOffice software. All the material is deposited in the collection of Predrag Jaksic in Belgrade (CPJB). Types of habitats and associations of each locality are described according to Davis et al. (2003).

Results and discussion

Zygaena (Mesembrynus) cynarae subsp.?

Material examined:

1 ♂, Montenegro, Mala Crna Gora (Durmitor N), Omar, 1400 m a.s.l., 8 August 1984; *leg.* P. Jaksic (coll. P. Jaksic, Belgrade) (fig. 1).

This discovery is remarkable because the nearest known population of this species (*Z. (M.) cynarae jadvovnika* Rauch, 1977) occurs in north-western Bosnia. The distance from Mala Crna Gora in Montenegro to Drvar in Bosnia and



Fig. 1. *Zygaena (M.) cynarae* subsp.? ♂, Montenegro, Mala Crna Gora (Durmitor N), Omar, 1400 m, 08. viii.1984; leg. P. Jakšić (coll. P. Jakšić, Belgrade, Serbia).

Fig. 2. *Zygaena (M.) cynarae jadovnika* Rauch, 1977 S, paratype, Bosnia and Herzegovina, Drvar, 8 km SW, 850-1,000 m, 03.-06.vii.1976; leg. H. & M. Rauch (coll. TLMF [Tiroler Landesmuseen, Ferdinandeum, Innsbruck, Austria])

Fig. 3. *Zygaena (M.) cynarae jadovnika* Rauch, 1977 ♂, allotype, Bosnia and Herzegovina, Drvar, 8 km SW, 850-1,000 m, 03.-06. vii.1976; leg. H. & M. Rauch (coll. TLMF)

Fig. 4. *Zygaena (M.) cynarae adriatica* Burgeff, 1926 S, Slovenia, Gradišče, Vipava, 250 m, 24.vi.1973; leg. H. & M. Rauch (coll. TLMF)

Fig. 5. *Zygaena (M.) cynarae adriatica* Burgeff, 1926 ♂, Slovenia, Nova Gorica, Trnovo, 750 m, 27.vi.1973; leg. H. & M. Rauch (coll. TLMF)

Fig. 6. *Zygaena (Z.) nevadensis pelisterensis* Reiss, 1976 S, Serbia, Vlasina, Vlasina Rid, 1300 m, 19.vi.2010; leg. P. Jakšić (coll. P. Jakšić, Belgrade, Serbia)



Map 1: The distribution of *Zygaena (M.) cynarae* subspecies in the Balkans.

Herzegovina (type locality of *Z. (M.) cynarae jadovnika*) is approximately 250 km as the crow flies. The locality in Montenegro is one of the southernmost known in Europe and it is the first record of the species for the central Balkan Peninsula.

The single female is a very large specimen, larger than all known examples from eastern Austria, Hungary, the south-eastern Alps and the Balkan Peninsula. As this specimen is not fresh and slightly damaged, we are unable to refer it to any described subspecies until further, fresh material is available.

Now three population groups of *Z. cynarae* are known from the former territory of Yugoslavia (map 1):

1. *Z. (M.) cynarae adriatica* Burgeff, 1926 (Slovenia (karst), Croatia (coastal regions southwards to Zadar)) (figs 4, 5)
2. *Z. (M.) cynarae jadovnika* Rauch, 1977 (Bosnia and Herzegovina, only known from the karst around Drvar) (figs 2, 3)
3. *Z. (M.) cynarae* subsp.? (Montenegro, Mala Crna Gora) (fig. 1)

Type of habitat and plant association at Omar:

91R0 Dinaric dolomite Scots pine forests (*Genisto januensis-Pinetum*)

PAL. CLASS.: 42.5C52

Pini illyricae - *Edraianthetum glisicii* Lks

***Zygaena (Zygaena) nevadensis pelisterensis* Reiss, 1976**

Material examined:

- 1 S Serbia, Šar-planina Mt., Durlov potok, 1750 m a.s.l., 23 July 2009; *leg.* A. Nahirnić (coll. P. Jakšić, Belgrade)
- 4 S Serbia, Vlasina, Vlasina Rid, 1300 m a.s.l., 19 June 2010; *leg.* P. Jakšić (coll. P. Jakšić, Belgrade) (fig. 6)
- 1 S Macedonia, Kocani S, Vidoviste, 500 m a.s.l., 28 June 1955; collector unknown (coll. Museum of Natural History, Skopje) (second known record for Macedonia)

Hitherto *Z. (Z.) nevadensis pelisterensis* Reiss, 1976, was known only from Macedonia (Baba Planina, Pelister (Reiss, 1976)), Greece (Aspropotamos in Trikala (Coutsis, 1988)) and Bulgaria (Rila) (Dutreix & Essayan, 1992). The above-mentioned records from Serbia are the first for this state (map 2).

Type of habitat and plant association at Durlov potok:

4060 Alpine and Boreal heaths

PAL. CLASS.: 31.4

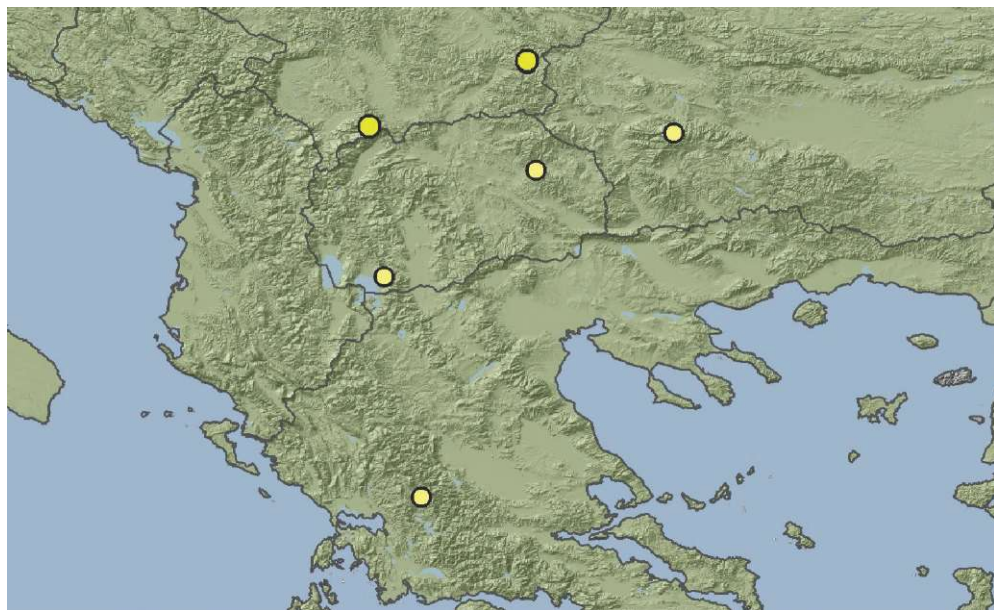
Rhododendro-Pinetum peucis M. Jank.

Type of habitat and plant association at Vlasina Rid:

6220 Pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea*

PAL. CLASS.: 34.5

Diantho-Armerietum rumeilcae N. Randjelović 1978

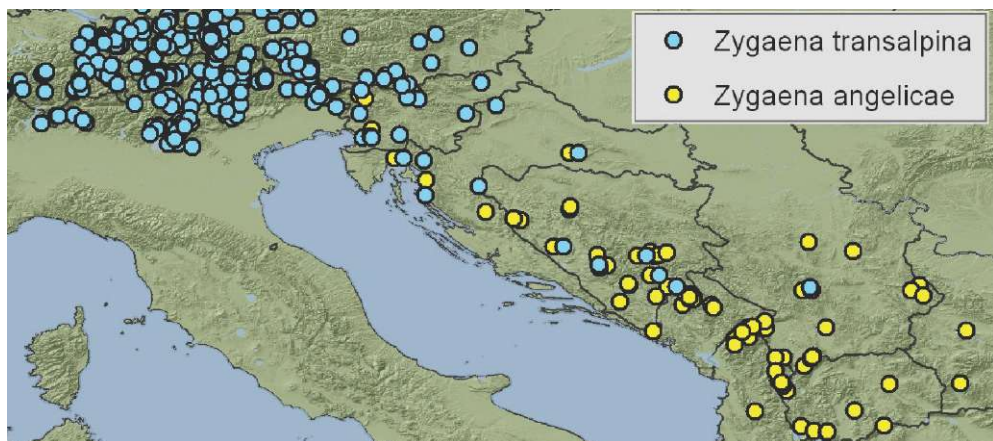


Map 2: The distribution of *Z. (Z.) nevadensis pelisterensis* in the Balkans.

Zygaena (Zygaena) transalpina* (Esper, 1780) / *Z. (Z.) angelicae* Ochsenheimer, 1808Material examined:*

- 2 S Serbia, Kopaonik Mountain, Bele Stene, 1700-1800 m, 23 July 2010; *leg.* P. Jaksic (coll. P. Jaksic, Belgrade) (figs 7, 8)
- 1 S Serbia, Kopaonik Mountain, Jaram, 1750 m, 8 July 1988; *leg.* P. Jaksic (coll. P. Jaksic, Belgrade) (fig. 9)

Z. (Z.) transalpina Esper, 1780, is known from the northernmost edge of the Balkan Peninsula (*Z. (Z.) transalpina hilfi* Reiss, 1922) (figs 10-12). Hofmann & Tremewan (1996) mention as its distribution Slovenia, Croatia (Istra) and with a '?' Bosnia and Herzegovina (Bihac). South and east of these areas only *Z. (Z.) angelicae* Ochsenheimer, 1808, is known (*Z. (Z.) angelicae herzegowinensis* Reiss, 1922, in the Balkans (figs 13, 14) and *Z. (Z.) angelicae angelicae* Ochsenheimer, 1808, in Austria and Hungary). However, Holik (1948) mentions several specimens of *Z. transalpina* within the range of *Z. angelicae* from Slovenia, Croatia and Bosnia and Herzegovina. Hybridisation cannot be excluded. It is therefore remarkable that on the top of Kopaonik Mountain in Serbia, a long distance away from the so-far south-eastern known *Z. transalpina* populations in Bosnia, 6-spotted specimens occur in the middle of the range of *Z. angelicae* (map 3). However, although only these three specimens (see above) are known at present, we can see that there must be gene-flow occurring between 6-spotted and 5-spotted populations, as one specimen clearly represents an intermediate form. It has to be stated that the figured map is still incomplete and preliminary and is based on the so far examined material and the most important literature data (e.g. Holik, 1948) only. It reflects therefore not the known distribution of both species. More literature and material in collections have to be examined and field studies to be undertaken. A more detailed study of this problem is in progress.



Map 3: The distribution of *Z. (Z.) transalpina* and *Z. (Z.) angelicae* in the Balkans.

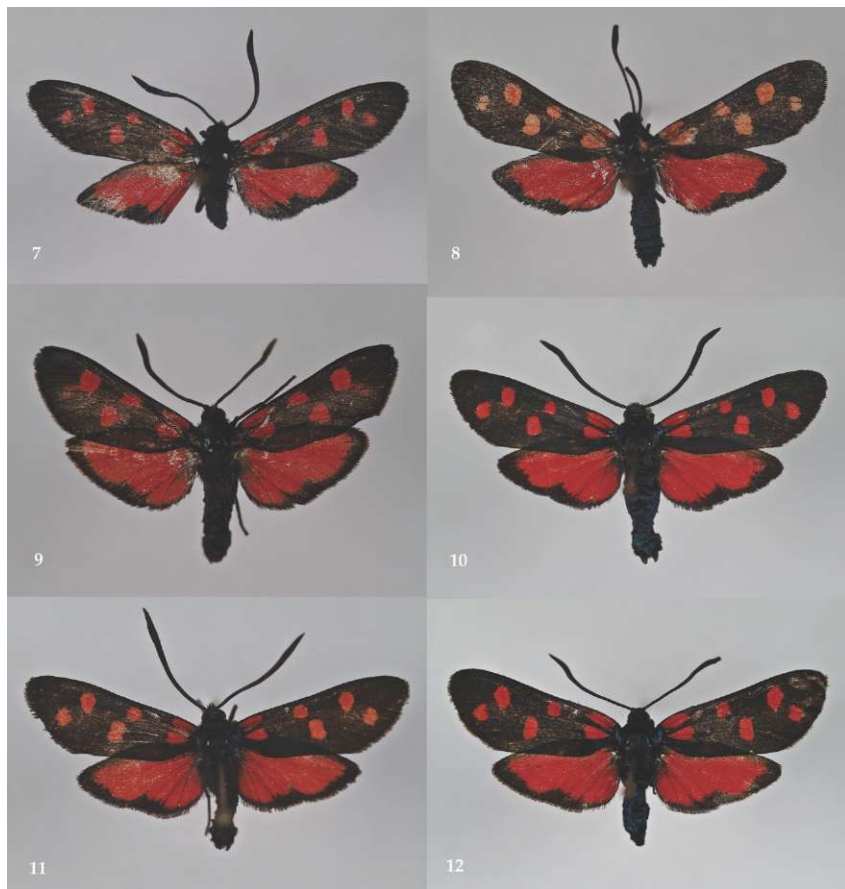


Fig. 7. *Zygaena* (*Z.*) *transalpina* (Esper, 1780) / *Z. (Z.) angelicae* Ochsenheimer, 1808 d, Serbia, Kopaonik Mountain, Bele Stene, 1800 m, 23.vii.2010; leg. P. Jakšić (coll. P. Jakšić, Belgrade, Serbia)

Fig. 8. *Zygaena* (*Z.*) *transalpina* (Esper, 1780) / *Z. (Z.) angelicae* Ochsenheimer, 1808 d, Serbia, Kopaonik Mountain, Bele Stene, 1700 m, 23.vii.2010; leg. P. Jakšić (coll. P. Jakšić, Belgrade, Serbia)

Fig. 9. *Zygaena* (*Z.*) *transalpina* (Esper, 1780) / *Z. (Z.) angelicae* Ochsenheimer, 1808 d, Serbia, Kopaonik Mountain, Jaram, 1750 m, 08.vii.1988; leg. P. Jakšić (coll. P. Jakšić, Belgrade, Serbia)

Fig. 10. *Zygaena* (*Z.*) *transalpina hilfi* Reiss, 1922 d, Slovenia, Gradišče, Vipava, 250 m, 24.vi.1973; leg. H. & M. Rauch (coll. TLMF)

Fig. 11. *Zygaena* (*Z.*) *transalpina hilfi* Reiss, 1922 d, Slovenia, Sv. Katarina, Bled, 634 m, 07.vii.1973; leg. H. & M. Rauch (coll. TLMF)

Fig. 12. *Zygaena* (*Z.*) *transalpina hilfi* Reiss, 1922 Ç, Slovenia, Gradišče, Vipava, 250 m, 24.vi.1973; leg. H. & M. Rauch (coll. TLMF)



Fig. 13. *Zygaena* (Z.) *angelicae herzegowinensis* Reiss, 1922 ♂, Bosnia and Herzegovina, Koricna, 1100 m, 18.vii.1973; leg. H. & M. Rauch (coll. TLMF)

Fig. 14. *Zygaena* (Z.) *angelicae herzegowinensis* Reiss, 1922 ♀, Bosnia and Herzegovina, Koricna, 1100 m, 18.vii.1973; leg. H. & M. Rauch (coll. TLMF)

Type of habitat and plant associations at Bele Stene and Jaram:

8220 Siliceous rocky slopes with chasmophytic vegetation

PAL. CLASS.: 62.2

Edraiantho-Saxifragetum sempervivi helianthemosum cani D. Lakušić 1987

Diantho-Seslerietum latifoliae Randelović, Rexhepi et V. Jovanović 1979

Piceetum excelsae serbicum Rudski 1947 *daphnetosum blagayanae* Mišić et Popović 1960

Acknowledgments

The authors are indebted to BIODAT Alpin (Innsbruck, Austria) and to Abteilung Kultur des Amtes der Tiroler Landesregierung (Innsbruck, Austria) for providing support for equipment and travel expenses. We thank Mr Axel Hofmann (Breisach-Hochstetten, Germany) for data, valuable comments and corrections. Moreover, we thank our colleague Stefan Heim (Tiroler Landesmuseen, Ferdinandeum, Innsbruck, Austria) for producing the photos and Mag. Hannes Kuehtreiber for producing the maps. Last but not least we thank Dr W. G. Tremewan (Truro, U.K.) for editing the English typescript.

References

- Alberti, B.**, 1938. Entwicklungs- und verbeitungsgeschichtliche Betrachtungen mit besonderer Berücksichtigung der mitteldeutschen Zygaeniden (Lepidoptera). *Zeitschrift für Naturwissenschaften, Halle* **92**: 35-65.
- Alberti, B.**, 1939. Eine neue Schmetterlingsart - *Procris drenowskii* nov. spec. - aus Bulgarien. *Mitteilungen aus den königlichen naturwissenschaftlichen Instituten in Sofia* **12**: 43-47.

- Alberti, B.**, 1966. Ergebnisse der Albanien-Expedition 1961 des deutschen Entomologischen Institutes. 54. Beitrag. Lepidoptera: Zygaenidae. *Beiträge zur Entomologie* **16**: 467-481.
- Burgermeister, F.**, 1964. Makrolepidopteren aus dem Raume Dubrovnik (Süddalmatien, FVR Jugoslawien). *Zeitschrift der Wiener Entomologischen Gesellschaft* **49**: 137-152.
- Coutsis, J. G.**, 1988. Records of *Zygaena* Fabricius, 1775, from Greece (Lepidoptera: Zygaenidae). *Entomologist's Gazette* **39**: 49-64, figs 1-27, maps 1-13.
- Daniel, F.**, 1957. Bemerkungen zu einigen *Zygaena*- und *Dysauxes* Arten Mazedoniens (Lepidoptera, Heterocera). *Acta Musei Macedonici Scientiarum Naturalium* **4**: 211-222.
- Daniel, F.**, 1958. Die Vertreter der Gattung *Zygaena* im Olympgebiet in Nordgriechenland. *Fragmenta Balcanica Musei Scientiarum Naturalium, Skopje* **2**: 37-46.
- Daniel, F.**, 1964. Die Lepidopterenfauna Jugoslawisch Mazedoniens. II. Bombyces et Sphinges. Zygaenidae. *Prirodnaučen Muzej Skopje*, Posebno isdanje, **2**: 6-20, figs 1-4.
- Daniel, F., Forster W., & Osthelder, L.**, 1951. Beiträger zur Lepidopterenfauna Mazedoniens. *Veröffentlichungen der Zoologischen Staatssammlung München* **2**: 1-78.
- Davies, E.C., Moss, D. & Hill, M.**, 2003. Interpretation Manual of European Habitats. Eur 25. European Commission DG Environment Nature and Biodiversity. 127 pp.
- Dutreix, C. & Essayan, R.**, 1992. *Zygaena nevadensis* Rambur (Lepidoptera, Zygaenidae), espece nouvelle pour la Bulgarie. *Acta zoologica Bulgarica* **44**: 82-83, fig. 1.
- Hofmann, A.**, 2003. *Zygaena (Zygaena) ephialtes* (Linnaeus, 1767) im südlichen Balkan nebst Anmerkungen zur Entstehung von Polymorphismus sowie melanistischer *Zygaena*-Formen im Mittelmeerraum (Lepidoptera: Zygaenidae). *Entomologische Zeitschrift mit Insekten-Börse* **113**: 50-54 (part 1), 75-86 (part 2), 108-120 (part 3), figs 1-95, tabs 1-3, 1 map.
- Hofmann, A. & Tremewan, W. G.**, 1996. *A Systematic Catalogue of the Zygaeninae (Lepidoptera: Zygaenidae)*. 251pp. Harley Books, Colchester.
- Holik, O.**, 1936. Beiträge zur Kenntnis der Zygaenen Südosteuropas. I (part 1). *Mitteilungen der Münchner Entomologischen Gesellschaft* **26**: 165-174.
- Holik, O.**, 1937. Beiträge zur Kenntnis der Zygaenen Südosteuropas. I (part 2). *Mitteilungen der Münchner Entomologischen Gesellschaft* **27**: 1-10.
- Holik, O.**, 1938. Beiträge zur Kenntnis der Zygaenen Südosteuropas. II. *Mitteilungen der Münchner Entomologischen Gesellschaft* **27** (1937, published 15.02.1938): 126-149.
- Holik, O.**, 1939a. Beiträge zur Kenntnis der Zygaenen Südosteuropas. III (part 1). *Mitteilungen der Münchner Entomologischen Gesellschaft* **29**: 55-69.
- Holik, O.**, 1939b. Beiträge zur Kenntnis der Zygaenen Südosteuropas. III (part 2). *Mitteilungen der Münchner Entomologischen Gesellschaft* **29**: 173-206.
- Holik, O.**, 1943. Beiträge zur Kenntnis der Zygaenen Südosteuropas. IV. *Mitteilungen der Münchner Entomologischen Gesellschaft* **33**: 306-343.

- Holik, O.**, 1948. Beiträge zur Kenntnis der Zygaenen Südosteuropas. IV. *Mitteilungen der Münchner Entomologischen Gesellschaft* **34** (1944): 387-417.
- Jakšić, P.**, 1990. Fauna Durmitora. Sveska 3. Zygaenoidea (Insecta, Lepidoptera). *Crnogorska akademija nauka i umjetnosti, Posebna izdanja, knjiga* **23**: 203-232, tabs I-IV, tabs 1-4, 2 col.-pls.
- Jakšić, P.**, 2006. The „burnets" and „foresters" (Zygaenidae) of the Prokletije Mountains and adjacent regions (Insecta: Lepidoptera). *Proceedings of the Fauna of Serbia* **7**: 19-34, 1 fig., 1 tab., 1 map.
- Naumann, C. M., Tarmann, G. M. & Tremewan, W. G.**, 1999. *The Western Palearctic Zygaenidae*. Apollo Books. 304 pp.
- Rauch, H.**, 1977a. Ein Beitrag zur Zygaenenfauna Bosniens (Lepidoptera, Zygaenidae). *Zeitschrift der Arbeitsgemeinschaft österreichischer Entomologen* **28** (1996): 109-116, figs 1-9, 1 map..
- Rauch, H.**, 1977b. Zweiter Beitrag zur Zygaenenfauna Bosniens (Lepidoptera, Zygaenidae). *Zeitschrift der Arbeitsgemeinschaft österreichischer Entomologen* **29**: 31-32, figs 1-8.
- Rauch, H.**, 1981. Ein Beitrag zur Zygaenenfauna der Insel Korcula in Dalmatien (Jugoslawien) (Lepidoptera, Zygaenidae). *Atalanta, Würzburg* **12**: 64-71, figs.
- Reiss, H.**, 1962. Beitrag zur Zygaenenfauna Griechenlands (Lep.) *Entomologische Zeitschrift Frankfurt a. M.* **72**: 217-231.
- Reiss, H. & Tremewan, W. G.**, 1962. Réponse à l'article „Qu'est-ce que la *Zygaena dalmatina* Bsd.?". *Bulletin de la Société Entomologique de Mulhouse* **1962**: 39-43.
- Silbernagel, A.**, 1944. Die Schmetterlinge der Ochrid-Gegend in Macedonien. II. Nachtrag und Berichtigungen zum I. Teile der gleichnamigen faunistischen Arbeit von Josef Thurner, die in den Mitteilungen aus dem königlichen naturwissenschaftlichen Instituten in Sofia, Bulgarien, Band XI. 1938 erschienen ist. *Zeitschrift der Wiener Entomologischen Gesellschaft* **29**: 29-31, 43-45, 93-94, 124-126, 153-155, 184-187 (Zygaenidae).
- Thurner, J.**, 1938. Die Schmetterlinge der Ochrid Gegend in Mazedonien. I. Teil. Macrolepidoptera. *Mitteilungen aus den königlichen naturwissenschaftlichen Instituten in Sofia* **11**: 121-179.
- Thurner, J.**, 1967. Lepidoptera aus Morea. Ein weiterer Beitrag zur Fauna des Peloponnes (Griechenland). *Zeitschrift der Wiener Entomologischen Gesellschaft* **52**: 5-23, 50-58.
- Verity, R.**, 1938-1939. Supplement to the „Butterfly races and Zygaenae of Macedonia". *Entomologist's Record and Journal of Variation* **50** (Suppl.): 1-15 (1938); **51** (Suppl.): 17-20 (1939) (Zygaenidae).

Received / Prejeto: 25. 3. 2011