



THE DISTRIBUTION OF *CRYPHIA OCHSI* BOURSIN, 1940 AND *CRYPHIA ALGAE* (FABRICIUS, 1775) (LEPIDOPTERA: NOCTUIDAE) IN SLOVENIA AND CROATIA

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Abstract - The distribution of the *C. algae/oehsi* species complex in Slovenia and Croatia was never a target of any systematic survey. Until now, *C. oehsi* was known only from the Krk island, Croatia, while no records from Slovenia or other parts of Croatia existed. We carried out a study of these two species in Slovenia and Croatia, based exclusively on the examination of the male and female genitalia to gain an insight into the distribution, phenology and altitudinal range of these two species. The results show that *C. oehsi* is present mostly in the coastal, generally Mediterranean and Sub-Mediterranean areas of Slovenia and Croatia. On the other hand, *C. algae* is a widely distributed species, present in most parts of both countries, but is less frequent in the Mediterranean region. *C. oehsi* is new to Slovenian Lepidoptera fauna. Both species prefer the lower altitudes, i.e. *C. oehsi* occurs mostly below 200 m a.s.l. The flight periods of both species range from June to end of September, in a single, long generation. The peak in their activity is in July and August, with some outstanding findings in April and October.

KEY WORDS: *Cryphia oehsi*, *Cryphia algae*, Noctuidae, Northern Adriatic fauna, phenology, vertical distribution, new records, genital structure

Izvešček - RAZŠIRJENOST VRST *CRYPHIA OCHSI* BOURSIN, 1940 IN *CRYPHIA ALGAE* (FABRICIUS, 1775) (LEPIDOPTERA: NOCTUIDAE) V SLOVENIJI IN NA HRVAŠKEM

Razširjenost kompleksa vrst *C. algae/oehsi* v Sloveniji in na Hrvaškem doslej ni bil predmet sistematičnih študij. Vrsta *C. oehsi* je bila znana le iz Hrvaške, z otoka Krka, za ostale dele Hrvaške in Slovenije pa ni bilo znanih podatkov. V prispevku

predstavljamo pregled novih podatkov za Slovenijo in Hrvaško, preverjenih na podlagi preiskav struktur spolnih organov samčkov in samic. Podajamo tudi nove podatke o razširjenosti, fenologiji in višinski razširjenosti vrst. Vrsta *C. ochsi* je razširjena v glavnem ob obali, predvsem v mediteranskem in submediteranskem delu Slovenije in Hrvaške. Vrsta *C. algae* je širše razširjena, pogosta predvsem v celinskem delu obeh držav in manj pogosta v sredozemskem območju. *C. ochsi* je nova vrsta za slovensko favno metuljev. Obe vrsti se pojavljata na nižjih nadmorskih višinah, *C. ochsi* pretežno pod 200 m nadmorske višine. Sezoni aktivnosti metuljev obeh vrst sta v času od junija do septembra v eni raztegnjeni generaciji, z največjo številčnostjo v juliju in avgustu in nekaj izstopajočimi podatki v aprilu in oktobru.

KLJUČNE BESEDE: *Cryphia ochsi*, *Cryphia algae*, Noctuidae, severni Jadran, favna, sovke, fenologija, višinska razširjenost, nove najdbe, strukture genitalij

Introduction

The Bryophilinae is a predominantly Holarctic Noctuidae subfamily, with about 150 species present in the Palaearctic region and 36 species occurring in Europe (Fibiger et al. 2009; Witt & Ronkay 2013). The members of this subfamily are small to medium-sized noctuids, usually of conspicuous colour, mimicking mosses and lichens, on which their larvae feed. Due to their similar appearance, the identification based solely on their external morphology can be difficult and imprecise (Fibiger et al. 2009).

Cryphia ochsi Boursin, 1940 is a small noctuid species, belonging to the *Cryphia algae* Fabricius, 1775 species complex. There are four externally very similar species of this complex occurring in Europe which are easily distinguishable by the differences in the genitalia, which are prominent and diagnostic in both sexes (Fibiger et al. 2009). As *C. ochsi* was described rather late, only in the middle of the 20th century (Boursin 1940), all historical records of *C. algae* prior to that time are open to doubt as they could refer to *C. ochsi*.

C. ochsi is distributed in the Mediterranean area of Europe, eastern Turkey and Iran (Fibiger et al. 2009); a record is known, however, from central Europe (Switzerland, Rezbanyai-Reser 1990), showing the need of a thorough survey to clarify the distribution of this species (Patočka & Turčani 2009).

According to the known distribution, *C. ochsi* is a xerothermophilic species preferring the Mediterranean area, while *C. algae* is more widely distributed, ranging from the Mediterranean to the northern part of Europe. The revision of the literature data of both species is needed, especially in the areas where they (may) occur sympatrically.

Our main goal was to gain an insight into the distribution, phaenology and vertical distribution of *C. ochsi* in the eastern Adriatic shoreline, in Slovenia and Croatia.

Material and methods

Specimens from the *C. algae/ochsi* species complex were collected during the last 20 years by S. Gomboc, and during the last several years by T. Koren. All individuals

of both species were collected in Slovenia and Croatia wherever they were found (Appendix I). To attract specimens, pyramid-shaped tents with two UV tube-shaped superactinic Philips TLD 05/15 W bulbs, powered with lead-acid batteries were used.

After collecting, specimens were set and placed into the authors' collections. In order to their correct identification, the abdomen of each collected specimen was removed and boiled in 10% KOH. After that, the genitalia were removed from the abdomen, cleaned and placed into lactic acid for five minutes and, after then, in pure ethanol for five minutes. Later they were stored in microvials filled with glycerol or fixed in Euparal. For the identification of specimens we used the illustrations and diagnoses of Fibiger et al. (2009).

Dates used in the text follow the format: day.month.year.

Results

In total, more than 300 specimens belonging to the *C. algae/ochsi* species complex were collected throughout Slovenia and Croatia. After the examination of the genitalia, 239 specimens were identified as *C. algae*, and 61 as *C. ochsi*.

The distribution of *C. ochsi* is limited to the Mediterranean and Sub-Mediterranean parts of both Slovenia and Croatia, while *C. algae* is present in all other regions of both countries (Fig. 1). A clear lack of data in inland Croatia is still visible on the map

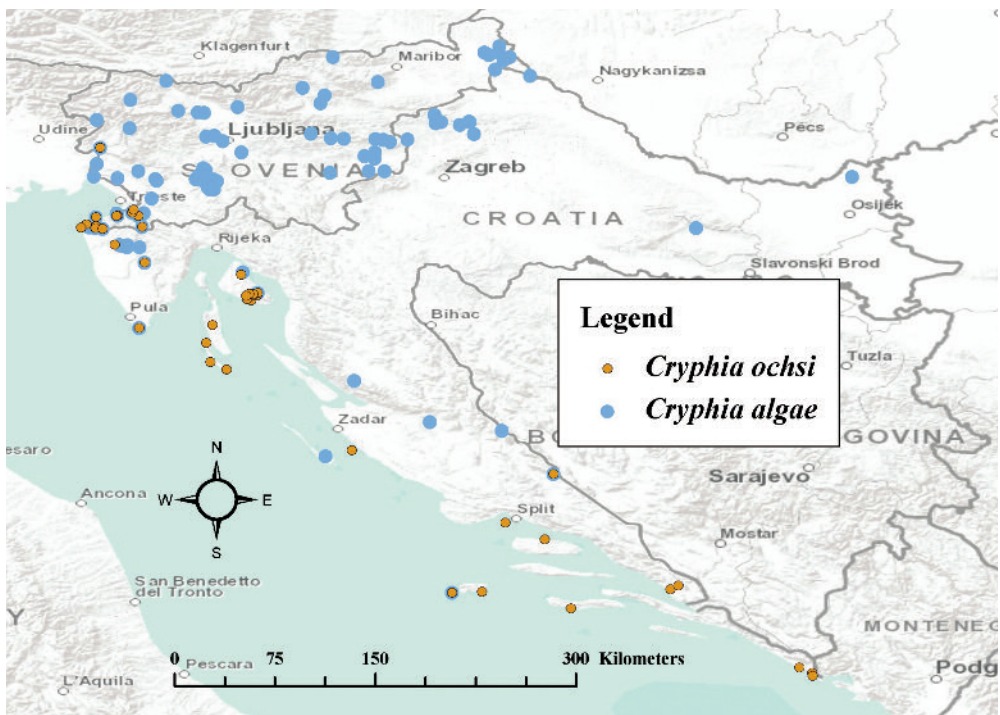


Fig. 1. Distribution of *C. ochsi* and *C. algae* in Slovenia and Croatia.

as this gap is supposedly a result of unsystematic data collecting.

The altitudinal distribution of *C. algae* ranged from 0 to 1100 m a.s.l., with most of the records occurring below 500 m a.s.l., with one record on 1680 m a.s.l. in the Julian Alps, on Planina Krstenica. *C. ochsi* was recorded at altitudes from 0 to 841 m a.s.l., on Mt. Dinara. Most of the records are from altitudes below 200 m (Fig.2).

According to studied data, the flight period of *C. algae* ranges from the beginning of June to the beginning of September, with the peak in activity from mid of July to the end of August, with outstanding records in April and October.

Flight period of *C. ochsi* ranges from mid-June to mid-September, with the peak of activities in July and one outstanding record also in October.

Discussion

Even in the most recent publication dealing with the genus *Cryphia* in Europe, the distribution of *C. ochsi* in the Northern Balkans was not clearly defined. A clear gap existed between Slovenia and Montenegro, and its known range did not include either Slovenia or Croatia (Fibiger et al. 2009). In general, not many published records exist for this species from the Balkans. In Serbia, *C. ochsi* is known from the central-west

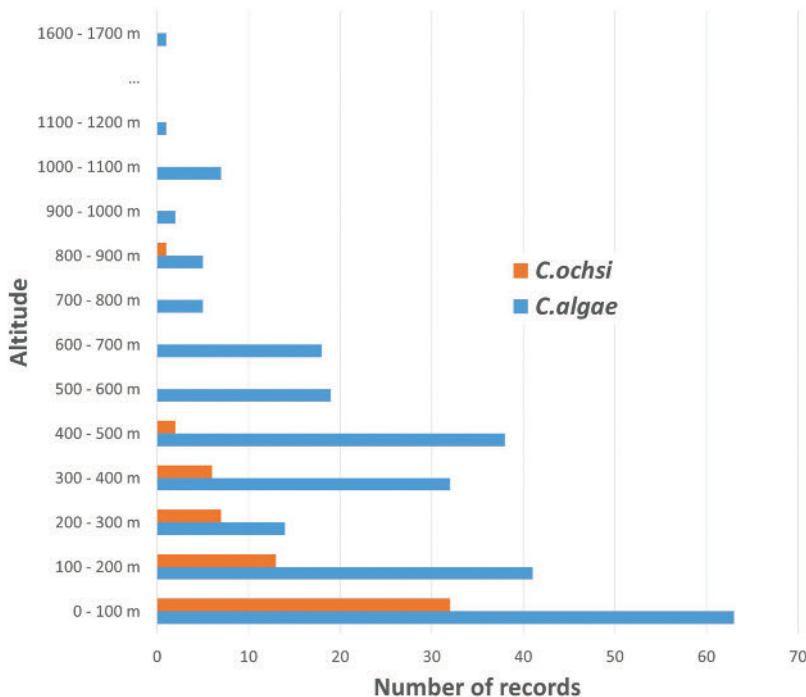


Fig. 2. Altitudinal range of *C. ochsi* and *C. algae* in Slovenia and Croatia.

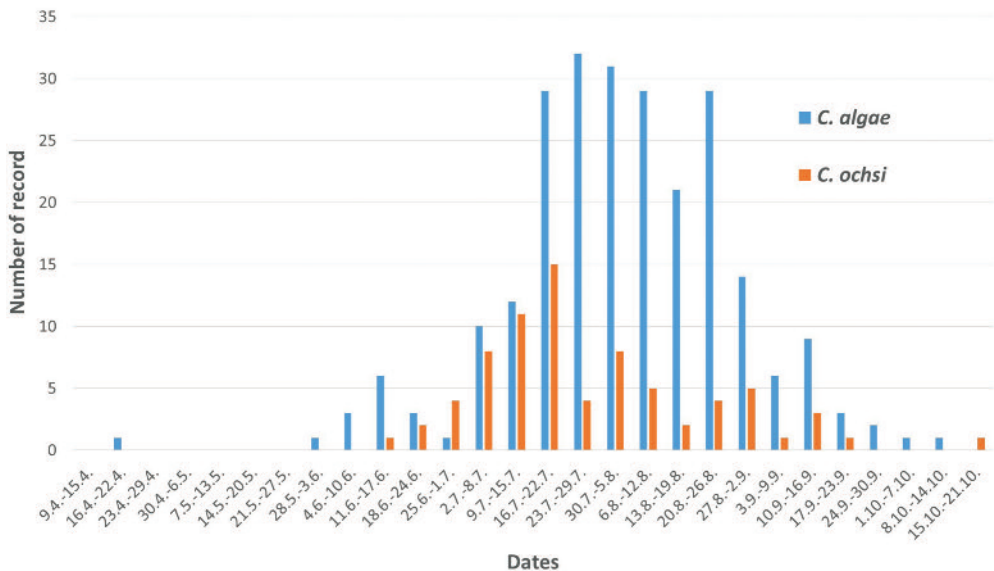
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Fig. 3. The flight period of *C. ochsi* and *C. algae* in Slovenia and Croatia.

and east Serbia (Stojanović & Ćurčić 2011), in the Republic of Macedonia it occurs in central and western parts of the country (Kasy 1961, Thurner 1964), in Romania in the southern Dobrogea region (Rákossy 1996), it is also present in Greece (Hacker 1989) and Bulgaria. Regarding the neighbouring countries, no data are known from Bosnia and Herzegovina (Lelo 2004) or Montenegro.

Our records of *C. ochsi* from Slovenia represent the first records for the country, as no literature records are available. The species is known from Croatia by a few records. A single male specimen from Croatia (without exact locality) was used by Patočka & Turčani (2009) to describe its pupa. The only records with exact data originate from the island Krk, where Habeler (2008) recorded it on five localities; no further records of this species were found for the country.

Our newly collected data closed the distribution gap that existed along the Adriatic coastline (Fibiger et al. 2009), and showed that *C. ochsi* is present from the coastline of Slovenia, throughout peninsular Istria, the Kvarner islands of Cres, Lošinj and Krk, towards northern Dalmatia and south Dalmatia including the islands of Brač, Korčula, Vis, the Neretva river delta, across the whole Konavle region, down to the border with Montenegro.

While *C. ochsi* is present mainly in the Mediterranean region, *C. algae* is distributed in all regions of both countries. As it seems, the contact zone of these two species is still incompletely known. While most records from the coastline and the islands belong to *C. ochsi*, several specimens of *C. algae* were also recorded from the same area. The two species occur here sympatrically, rendering the identification based solely on the geographic location unreliable. Both species prefer lower altitudes, with only occasional records from the higher altitudes.

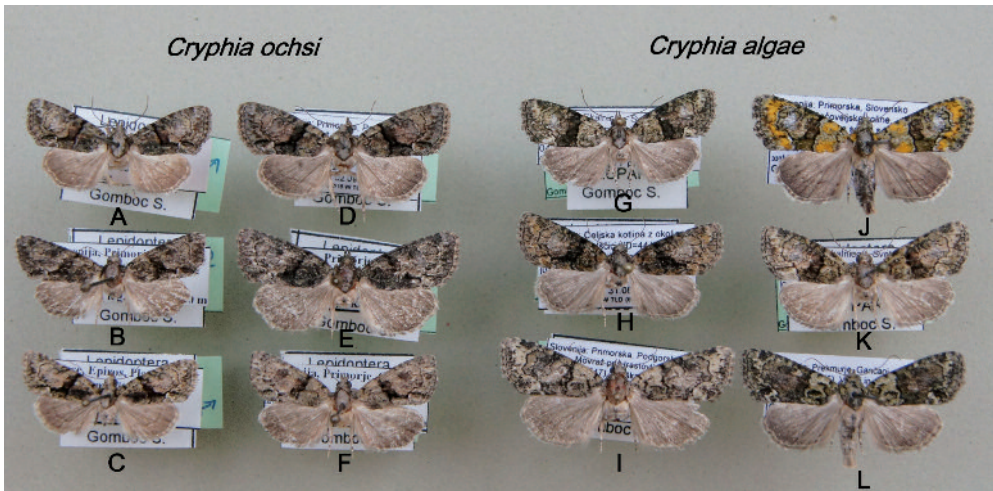


Fig. 4. Specimens of *C. ochsi* and *C. algae*:

A – *C. ochsi*, male, Croatia, Krk island, Konobe camp near Punat, 16.6.2001, Gomboc S. leg., Euparal slide nr. 320.

B – *C. ochsi*, female, Slovenia, Slovensko primorje, Osp, cave depression, Osapska jama, 23.8.1999, Gomboc S. leg., Euparal slide nr. 322.

C – *C. ochsi*, male, Greece, Epiros, Plataria near Igoumenitsa, 5.7.2000, Gomboc S. leg., Euparal slide nr. 318.

D – *C. ochsi*, female, Slovenia, Primorska, Podgorski kras, Movraž near Hrastovlje, 2.9.2006, Gomboc S. leg., Euparal slide nr. 323.

E – *C. ochsi*, female, Slovenia, Slovensko primorje, Osp, cave depression, Osapska jama, 23.8.1999, Gomboc S. leg., Euparal slide nr. 326.

F – *C. ochsi*, male, Slovenia, Slovensko primorje, Osp, cave depression, Osapska jama, 23.8.1999, Gomboc S. leg., Euparal slide nr. 324.

G – *C. algae*, male, Slovenia, Primorska, Skalnica near Nova Gorica, Sv. Gora, 4.8.2001, Gomboc S. leg., Euparal slide nr. 321.

H – *C. algae*, female, Slovenia, Celjska kotlina, Lom near Topolščica, 31.8.2002, Gomboc S. leg., Euparal slide nr. 319.

I – *C. algae*, female, Slovenia, Primorska, Podgorski kras, Movraž near Hrastovlje, 2.9.2006, Gomboc S. leg., Euparal slide nr. 329.

J – *C. algae*, male, Primorska, Slovensko primorje, Sečoveljske soline, Fontanigge, old saline's with halophytes, 4.9.2010, Gomboc S. leg.

K – *C. algae*, male, Slovenia, Primorska, Skalnica near Nova Gorica, Sv. Gora, 4.8.2001, Gomboc S. leg., Euparal slide nr. 328.

L – *C. algae*, male, Slovenia, Prekmurje, Gančani, 15.6.2007, Gomboc S. leg.

In the butterfly fauna of the Adriatic islands, there is a clear differentiation between coastal species, and species inhabiting both the islands and the coastline, which are usually more common and widely distributed (Withrington & Verovnik 2008). This

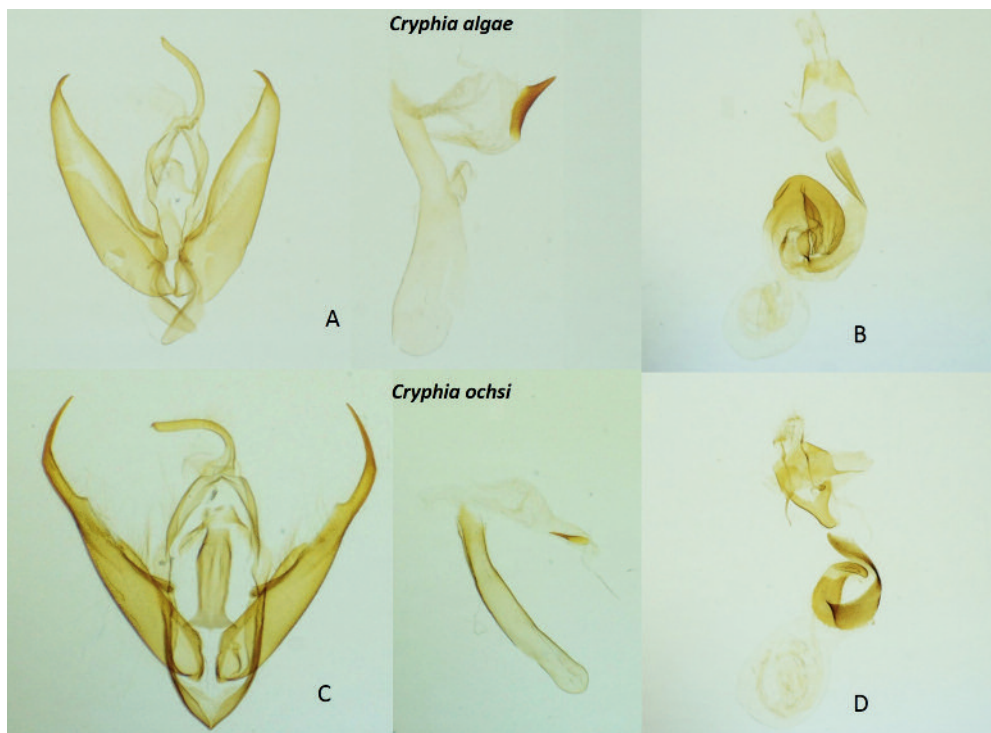


Fig. 5. Male and female genitalia of *C. algae* and *C. ochsi*:

A – *C. algae*, male with everted vesica, Slovenia, Primorska, Skalnica near Nova Gorica, Sv. Gora, 4.8.2001, Gomboc S. leg., Euparal slide nr. 321.

B – *C. algae*, female, Slovenia, Celjska kotlina, Lom near Topolščica, 31.8.2002, Gomboc S. leg., Euparal slide nr. 313.

C – *C. ochsi*, male with everted vesica, Greece, Plataria near Igoumenitsa, 5.7.2000, Gomboc S. leg., Euparal slide nr. 318.

D – *C. ochsi*, female, Slovenia, Slovensko primorje, Osp, cave depression, Osapska jama, 23.8.1999, Gomboc S. leg., Euparal slide nr. 322.

may indicate that *C. ochsi* can be regarded as a common species, and many new records are to be expected from other islands, as well as from the coastline.

While most of our records originate from the islands and the coastline, we have several records from the inner part of Istria and Dalmatia, which indicates that this species could be present in other warmer parts of the country. Especially interesting is the record from the Dinara Mt., where *C. algae* and *C. ochsi* were recorded sympatrically. Accordingly, records of *C. ochsi* from Bosnia and Herzegovina are also to be expected, as the locality on Mt. Dinara is located only a few kilometres from the Bosnia and Herzegovina border. Also, this species will probably be recorded in the coastal part of Bosnia and Herzegovina, in the vicinity of Neum.

Our records on the phaenology of *C. ochsi* somewhat widened the known flight period of this species, from July-September (Fibiger 2009) to June-October. The records from April and October of *C. algae/ochsi* can be regarded as unusual deviation from the main flight period.

To gain a more complete knowledge on the distribution of *C. ochsi* in the Balkans, additional surveys of the inner parts of Croatia, as well as other Balkan countries, are needed and recommended.

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Appendix I. Records of *C. ochsi* and *C. algae* used in this study.

Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
<i>Cryphia algae</i>					
HR: Baranja, Podolje - Branjina, hill	25.08.2012	KT	45.80977	18.698926	198
HR: Brezovac valley, Mount Dinara	04.08.2012	KT	44.10471	16.345163	1027
HR: Dalmatia, Vis island, Komiža surroundings, Podhumlje, maquis	17.7.2015	GS	43.01638	16.009693	255
HR: Dinara, Kruškovac, Kodžomanove staje	05.08.2015	KT	43.81327	16.692615	841
HR: Dugi Otok, Kruševo Polje	02.07.2014	KT	43.93285	15.160478	39
HR: Hrvatsko Zagorje, Klimen village	07.07.2012	KT	46.09811	16.157557	248
HR: Istra, Livade, 500m S from the village	14.08.2012	KT	45.35038	13.830685	19
HR: Istra, Motovun, inside the village	10.09.2011	KT	45.33601	13.827880	253
HR: Istra, Pazin, Drazej	18.07.2008	KT	45.23463	13.944495	316
HR: Istra, Ponte Porton, 2 km E of the village	05.06.2012	KT	45.35092	13.777430	21
HR: Istra, Ponte Porton, 500 m E from the village	17.04.2013	KT	45.35224	13.774108	9
HR: Istra, Premantura near Pula, Kamenjak, near the pond	31.7.2015	GS, KT	44.7934	13.9075762	17
HR: Istra, Trombal, 1.5 km NE of the village	20.06.2012	KT	45.34623	13.801922	10
HR: Istra, Valica village	02.06.2011	KT	45.4701	13.573231	99
HR: Istra, Valice-Krti, forest path near the village	06.06.2012, 17.08.2012	KT	45.33685	13.910153	25
HR: Ivanščica, vojni poligon na vrhu	10.08.2015	KT	46.17927	16.130032	1020
HR: Krapinsko-Zagorska županija, Đurmanec, Gornje Jesenje, Lužani Zagorski	4.7.2015	GS, KT	46.22663	15.892777	400
HR: Krapinsko-zagorska županija, Ivanščica, Lobor, stone-pit	2.8.2014	GS, KT	46.15702	16.063817	296
HR: Krapinsko-zagorska županija, Ivanščica, peak of Ivanščica	2.8.2014, 30.8.2014, 24.7.2015	GS	46.18014	16.124256	1015
HR: Krapinsko-zagorska županija, Klanjec, Risvica, Sv. Marija Risvica church	3.7.2015, 25.7.2015	GS, KT	46.06173	15.711178	295
HR: Krapinsko-Zagorska županija, Strahinjščica, Radoboj, Sv. Jakov, Plat, xerotherm meadows	20.7.2014, 29.8.2014, 9.9.2014	GS, KT	46.17689	15.939217	490
HR: Krapinsko-zagorska županija, Strahinjščica, Strahinje Radobojsko, south part	23.7.2015	GS, KT	46.1704	15.900504	390
HR: Krapinsko-zagorska županija, Strahinjščica, Strahinje Radobojsko, thermophile forest on south slope	20.7.2014, 3.8.2014	GS, KT	46.17638	15.910485	356
HR: Krk island, Čižiči-Rudine	20.8.2001	GS	45.17019	14.605460	1

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Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
HR: Krk island, Doline under Hlam	17.6.2001	GS	45.02546	14.695897	200
HR: Krk island, Mali Hlam, path to the sheep pastures	18.8.2001, 24.8.2001	GS	45.02953	14.704049	400
HR: Lika, Kaštel Žegarski village surroundings	03.07.2010	KT	44.16211	15.861761	58
HR: Slavonija, Papuk, Vranduk	09.06.2012, 24.08.2012	KT	45.46574	17.652506	297
HR: Velebit, Visočica, Jadrina Poljana	12.08.2015	KT	44.43816	15.353560	1185
SI: Benečija, Goriška brda, Skalnica N.G., peak	4.8.2001	GS	46.00584	13.646981	500
SI: Celjska kotlina z okolico, Kale near Šempeter	3.7.2002, 14.7.2002, 19.7.2002, 21.7.2002, 26.7.2002	GS	46.30321	15.128203	440
SI: Celjska kotlina z okolico, Lipje near Velenje	12.7.2002, 14.7.2002, 19.7.2002, 21.7.2002, 24.7.2002, 29.7.2002, 1.8.2002, 2.8.2002, 4.8.2002, 6.8.2002, 8.8.2002, 10.8.2002, 19.8.2002, 21.8.2002, 22.8.2002, 23.8.2002, 24.8.2002, 28.8.2002	GS	46.35638	15.156330	480
SI: Celjska kotlina z okolico, Lom near Topolščica	9.7.2002, 28.7.2002, 5.8.2002, 14.8.2002, 31.8.2002, 21.8.2002, 26.7.2002	GS	46.40646	15.008060	580
SI: Dolenjska, Gorjanci, Kamence (Brežice)	19.7.2006	GS	45.8493	15.558979	388
SI: Dolenjska, Žadovinec pri Krškem, dry meadows at Sava river	5.9.2014	GS	45.93084	15.490580	155
SI: Gorenjska, Jeseniška planina, Javorniški Rovt	18.8.2011	GS	46.45428	14.091400	978
SI: Gorenjska, Kamniško- Savinjske Alpe, Kamniški vrh, Slevo	16.8.2006	GS	46.27742	14.570661	720

Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
SI: Goričko, Bukovnica	22.7.1994, 22.7.1994	GS	46.68705	16.327859	200
SI: Gotjanci, Novomeška dolina, Trška gora near Novo mesto	2.8.2003, 18.7.2003, 31.7.2003	GS	45.83672	15.191105	350
SI: Julijske Alpe, Stara Fužina, Planina Krstenica	26.7.2013	GS	46.32501	13.850636	1658
SI: Krško hribovje, Ajdovska cave near N. vas	17.6.1999	GS	45.94863	15.424480	450
SI: Krško hribovje, Podsreda, Oslica, dry grasslands	25.8.2005	GS	46.06246	15.496475	650
SI: Krško hribovje, Sremič, vinogradi, Krško	12.8.2003	GS	45.97384	15.494521	400
SI: Krško hribovje, Vetrnik, Kozjansko	9.8.2003	GS	46.05812	15.551493	650
SI: Krško hribovje, Zavode pri Kostanjevici	19.7.2004	GS	45.84724	15.451760	300
SI: Ljubljanska kotlina, Gajniče, wet meadows	2.8.2012	GS	45.97343	14.595793	302
SI: Ljubljanska kotlina, Kranj, Stražišče	29.7.2006, 8.8.2006, 25.7.2008, 3.8.2008, 4.8.2008, 4.9.2008, 2.8.2009, 18.8.2009, 18.8.2004, 27.8.2004	GS	46.23828	14.345612	380
SI: Ljubljanska kotlina, Ljubljana, Vič, Biotechnical Faculty	27.7.2006	GS	46.05058	14.469832	297
SI: Ljubljanska kotlina, Sv. Jošt near Kranj	19.7.2004	GS	46.24239	14.302732	830
SI: Notranjska, Cerknško jezero, Dolenje Jezero	16.8.2009	GS	45.77207	14.354313	549
SI: Notranjska, Cerknško jezero, Gorenje Jezero, wet grasslands	29.7.2009	GS	45.72392	14.412576	548
SI: Notranjska, Cerknško jezero, Otok (Cerknica), Otočec	2.9.2009	GS	45.74025	14.368572	552
SI: Notranjska, Cerknško jezero, Otok (Cerknica), Otoški grič	12.8.2008, 22.8.2008	GS	45.74117	14.37734	548
SI: Notranjska, Cerknško jezero, Otok (Cerknica), Tresenec	18.7.2007	GS	45.72653	14.384092	550
SI: Notranjska, Hrušica, Nanos, Strmec	30.7.2005, 16.7.2014	GS	45.79377	14.018947	782
SI: Notranjska, Menišija, Begunje pri Cerknici, Ruparjev vikend	26.8.2009	GS	45.82083	14.359683	625
SI: Notranjska, Menišija, Bezuljak, Senožeti	23.7.2007, 14.7.2009	GS	45.84174	14.354577	606

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Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
SI: Notranjska, Menišija, Dobec	5.9.2008, 21.8.2009	GS	45.85165	14.358260	677
SI: Notranjska, Menišija, Padež (Vrhnika), Brejnice	31.7.2008	GS	45.86755	14.339398	591
SI: Notranjska, Menišija, Rakek, Rjava luža	28.7.2008, 18.8.2008	GS	45.82829	14.320843	660
SI: Notranjska, Rakov Škocjan, Naravni most	6.8.2009	GS	45.79515	14.287733	550
SI: Notranjska, Slivnica, Cerknica, Velika Slivnica, peak	24.7.2008	GS	45.79107	14.410251	1097
SI: Notranjska, Slivnica, Grahovo, Strmec	16.8.2007	GS	45.77981	14.430556	628
SI: Notranjska, Suha krajina, Rakov Škocjan, Rak	1.7.2008	GS	45.79237	14.291091	517
SI: Podgorski Kras, Brkini, Debeli hrib pri Podgorju, south slope	11.7.2011, 14.7.2012	GS	45.54299	13.917032	500
SI: Podgorski Kras, Brkini, Prešnica, grasslands with shrubs	17.7.1996, 2.7.2002	GS	45.56523	13.938485	460
SI: Podgorski Kras, Brkini, Škocjan pri Divači, Škocjanske jame, cemetery	23.8.2012, 31.7.2013, 29.7.2015	GS	45.66477	13.993329	424
SI: Pohorje, Hmeljišče, Radlje at Drava river	25.7.2001, 8.8.2004	GS, VD	46.61362	15.211393	370
SI: Pohorje, Smrečno, Kolonija	13.8.2000, 9.8.2001	GS	46.44505	15.514186	800
SI: Prekmurje, Dobrovnik	28.7.2001, 9.6.2000, 21.7.2004, 14.7.2007, 17.7.2010, 16.7.2010, 28.7.2012, 24.8.2012, 20.7.2013, 22.8.2015	GS	46.64606	16.322334	174
SI: Prekmurje, Dolnja Bistrica	20.8.1990	LM	46.53126	16.302519	170
SI: Prekmurje, Gančani	13.7.1996, 19.8.1993, 13.6.1993, 6.8.1991, 20.7.1988, 13.8.1993, 6.7.1999, 9.8.1999, 19.8.2007, 15.6.2007, 21.6.2008, 2.8.2008,	GS	46.62842	16.259323	179

Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
	17.7.2009, 27.7.2012				
SI: Prekmurje, Gančani, Pišnjače	25.7.1998	GS	46.64354	16.227357	180
SI: Prekmurje, Genterovci	13.7.1983	GŠ	46.61271	16.399950	165
SI: Prekmurje, Mala Polana, Črni log	23.6.2002, 20.7.2004	GS	46.59229	16.356545	166
SI: Prekmurje, Mala Polana, Črni log, pond in the forest	21.7.2013	GS	46.59449	16.361237	163
SI: Prekmurje, Murska šuma	16.7.1998, 16.7.1998, 14.8.1998, 24.7.1998	GS	46.48707	16.535209	160
SI: Primorska, Benečija, Goriška brda, Kolovrat, Livške Ravne	23.8.2011	GS	46.19231	13.624129	1073
SI: Primorska, Komenski kras, Komen, Volčji Grad	28.9.2014	GS	45.80103	13.764589	241
SI: Primorska, Koprsko primorje, Koper/Capodistria, Srmin, reeds	3.9.2006, 27.7.2007	GS	45.56445	13.758642	2
SI: Primorska, Krajinski park Strunjan, Strunjan/Strugnano, Rtič Ronek	9.8.2013	GS	45.53759	13.617540	41
SI: Primorska, Podgorski Kras, Črnotiče, Klavznik, Kraški rob	13.7.2012	GS	45.54767	13.902074	427
SI: Primorska, Podgorski Kras, Movraž pri Hrastovljah, Kraški rob	2.9.2006, 23.9.2006	GS	45.47313	13.929102	284
SI: Primorska, Šentviška planota, Ponikve (Tolmin), Lovska koča Ponikve	22.7.2011	GS	46.13672	13.843727	813
SI: Primorska, Sežanski Kras, Planina (Ajdovščina), Koboli	19.7.2012	GS	45.84719	13.901964	386
SI: Primorska, Slovensko primorje, Koper/Capodistria, Škocjanski zatok, eastern part	13.7.2010, 17.8.2010, 11.9.2010, 20.7.2012	GS	45.5491	13.762284	1
SI: Primorska, Slovensko primorje, Sečoveljske soline, Fontanigge, old saline's with halophytes	24.6.2010, 11.7.2010, 20.7.2010, 23.7.2010, 2.8.2010, 10.8.2010, 21.8.2010, 26.8.2010, 4.9.2010, 14.9.2010, 2.8.2011, 27.8.2011, 21.7.2012, 7.9.2012,	GS	45.46486	13.612567	1

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Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
	27.9.2012, 11.8.2013, 13.9.2013, 10.8.2014				
SI: Primorska, Slovensko primorje, Sečoveljske soline, old mine, reeds	28.7.2010, 11.8.2010, 2.9.2010, 15.7.2011, 14.9.2012, 10.8.2013, 13.8.2013	GS	45.47918	13.619327	1
SI: Sežanski Kras, Brestovica pri Komnu	4.10.2012, 26.9.2013, 20.7.1998	GS	45.81269	13.603130	25
SI: Škofjeloško-Polhograjsko hribovje, Belo, Polhov Gradec	5.8.1995	GS	46.0794	14.358827	630
SI: Škofjeloško-Polhograjsko hribovje, Dražgoše	5.8.1999	GS	46.2521	14.170555	700
SI: Škofjeloško-Polhograjsko hribovje, Toško čelo	21.8.2000	GS	46.08435	14.414134	400
SI: Slovensko primorje, Osp, cave depression, Osapska jama	4.8.1999, 23.8.1999	GS	45.57232	13.861229	60
SI: Slovensko primorje, Osp, Pod Steno near village	1.9.2011	GS	45.56748	13.861477	60
SI: Slovensko primorje, Sv. Peter at Dragonja	20.8.1998	GS	45.45919	13.662420	125
SI: Štajerska, Kozjansko, Kozjanski park, Podsreda, Stara sveta gora	16.8.2011, 26.8.2011, 3.8.2012, 6.8.2013, 17.7.2014	GS	46.04277	15.594339	349
SI: Štajerska, Kozjansko, Kozjanski park, Vetrnik, forest road and clearings	13.8.2014	GS	46.05854	15.546676	610
SI: Štajerska, Posavsko hribovje, Dobovec, Kum, Lontovž, abandoned ski slope	12.8.2014	GS	46.09842	15.063603	891
SI: Štajerska, Posavsko hribovje, Radeče, Čelovnik, Obrežje	1.9.2015	GS	46.07015	15.197182	466
SI: Štajerska, Zasavje, Lisca, Tončkov dom	23.8.2013	GS	46.06723	15.285057	921
SI: Trnovski gozd, Hrušica, Nanos, Strmec, 900 m, south slopes	16.7.2014	GS	45.78436	14.025966	869
SI: Vipavska dolina, Bilje near Nova Gorica	23.8.1995, 21.8.1995, 6.9.1995, 25.8.1995, 19.8.1995, 17.8.1995, 12.8.1995,	GS, CB	45.8963	13.624489	48

Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
	7.8.1995, 4.8.1995, 1.8.1995, 29.7.1995, 28.7.1995				
<i>Cryphia ochsi</i>					
HR: Čiovo island, Slatine, along roads and tracks above chapel of Gospa Prizidnica	17.07.2013	KT	43.48562	16.368627	50
HR: Cres island, between Hrasta i Grmov	17.07.2015	KT	44.81478	14.399491	193
HR: Dalmacija, otok Brač, Postira, settlement	9.7.2015	RN	43.37374	16.632625	30
HR: Dalmacija, otok Korčula, Općina Blato, Prižba, local field road from Prižba to Blato	2.7.2014, 6.7.2014	GS	42.91065	16.809907	133
HR: Dalmatia, Vis Island, Komiža surroundings, Podhumlje, maquis	17.7.2015	GS	43.01638	16.009693	255
HR: Dalmatia, Vis Island, Rukavac, village, parking to the beach	15.7.2015	GS	43.02155	16.211200	20
HR: Dinara, Kruškovac, Kodžomanove staj	05.08.2015	KT	43.81327	16.692615	841
HR: Istra, Crveni Vrh, Parenzana	15.09.2014	KT	45.48909	13.553014	61
HR: Istra, Pazin, Drazej	18.07.2008	KT	45.23463	13.944495	316
HR: Istra, Pazin, Vela Traba village	24.08.2009, 10.07.2014	KT	45.46891	13.517807	300
HR: Istra, Premantura near Pula, Kamenjak, entry point at Premantura	31.7.2015	GS, KT	44.7934	13.907576	17
HR: Istra, Žudetići, 400 m souther of the village, Motovun forest	22.07.2012	KT	45.35297	13.744194	31
HR: Konavle, Mikulići, 500m E of the village	29.07.2012	KT	42.47864	18.430648	168
HR: Konavle, Molunat	30.07.2012	KT	42.45818	18.432475	70
HR: Konavle, Radovčići, 500 m N of the village	30.07.2012	KT	42.5143	18.343512	182
HR: Krk island, Čižići	18.7.1999	GS	45.15134	14.594771	3
HR: Krk island, Draga Bašćinska	18.07.2015	KT	45.01296	14.69949	119
HR: Krk island, Hrusta	23.7.1996, 19.7.1999, 21.7.1999	GS	44.97833	14.661488	150
HR: Krk island, Konobe	21.7.1996, 12.7.1999, 16.6.2001	GS	44.98688	14.632308	50
HR: Krk island, Mali Hlam, path to the sheep pastures	22.6.2005, 18.8.2001	GS	45.02953	14.704049	400
HR: Krk island, Malmašuta, forest clearings with Pinus nigra	17.7.1999, 22.8.2001	GS	45.01556	14.676985	350

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Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
HR: Krk island, Malmašuta, forest road	23.8.1997, 24.7.1996, 29.8.2005	GS	45.01961	14.674803	290
HR: Krk island, Punat surroundings, footpath on Veli vrh	20.7.1999	GS	45.0249	14.645606	240
HR: Krk island, Punat, maquis near the coast	25.8.1997, 16.7.1999	GS	45.00961	14.625681	20
HR: Lošinj island, Osor, Osorščica, northern slopes	20.10.2014	GS, KT	44.69342	14.359089	130
HR: Lošinj, western from Artatore	15.07.2014	KT	44.56599	14.386524	43
HR: Mali Lošinj island, Mali Lošinj, south part, stony pastures, Kalvarija	30.6.2012	GS	44.51633	14.494283	170
HR: Mali Lošinj, south part, stony pastures, Kalvarija	30.06.2012	KT	44.51633	14.494283	136
HR: Neretva, Rogotin, 500 m S	07.08.2012	KT	43.04005	17.477583	21
HR: Neretva, Strimen village surroundings	07.09.2012	KT	43.0637	17.529805	50
HR: Pašman island, SW of village Neviđane	27.07.2015	KT	43.97344	15.335652	36
SI: Benečija, Goriška brda, Skalnica at nova Gorica, hill peak	4.8.2001	GS	46.00584	13.646981	500
SI: Primorska, Krajinski park Strunjan, Strunjan/Strugnano, Rtič Roněk	9.8.2013	GS	45.53759	13.617540	41
SI: Primorska, Podgorski Kras, Črnotiče, kraška planota, Klavznik, Kraški rob	13.7.2012	GS	45.54767	13.902074	427
SI: Primorska, Podgorski Kras, Movraž pri Hrastovljah, Kraški rob	2.9.2006	GS	45.47313	13.929102	284
SI: Primorska, Slovensko primorje, Koper/Capodistria, Škocjanski zatok, eastern part	17.8.2010	GS	45.5491	13.762284	1
SI: Primorska, Slovensko primorje, Koper/Capodistria, Škocjanski zatok, eastern part	20.7.2012	GS	45.54698	13.755927	1
SI: Primorska, Slovensko primorje, Sečoveljske soline, Fontanigge, old saline with halophytes	24.6.2010, 11.7.2010, 2.8.2011, 27.8.2011, 7.9.2012, 10.8.2014	GS	45.46486	13.612567	1
SI: Primorska, Slovensko primorje, Sečoveljske soline, old mine, reeds	2.9.2010, 10.7.2012, 14.9.2012	GS	45.47918	13.619327	1
SI: Primorska, Slovensko primorje, Sečovlje/Sicciole, Fontannige, shrubs with <i>Prunus spinosa</i>	10.7.2012	GS	45.46575	13.614936	1

Locality	Date	Legit	WGS84 N	WGS84 E a.s.l. m	Altitude
SI: Slovensko primorje, Osp, cave depression, Osapska jama	23.8.1999	GS	45.57232	13.861229	60
SI: Slovensko primorje, Osp, cave depression, Pod Steno	1.9.2011	GS	45.56748	13.861477	60
SI: Slovensko primorje, Socerb, on the plateau	1.8.1996	LM	45.58842	13.869255	400
SI: Slovensko primorje, Sv. Peter near Dragonja	10.7.1998	LM	45.45919	13.662420	125

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