

NEW DATA ABOUT THE DISTRIBUTION AND ALTITUDINAL SPAN OF THE DALMATIAN RINGLET, *PROTEREBIA AFRA DALMATATA* (GODART, [1824]) (LEPIDOPTERA: SATYRINAE) IN CROATIA

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Abstract - During the survey of butterfly fauna of Dalmatian mountains in the last years, *Proterebia afra dalmata* (Godart, 1824) was found on several new sites, including the first records of this subspecies at higher altitudes (Poštak, Svilaja, Promina, Kamešnica and Dinara Mts.). In this paper we present a much more complete picture of the distribution of this presumably rare butterfly and discuss its altitudinal distribution. The species was found at altitude of almost 1500 m, therefore the characterization of the subspecies as a lowland butterfly can be dismissed.

KEY WORDS: *Proterebia afra dalmata*, Dalmatia, distribution, altitudinal span

Izvleček – NOVI PODATKI O RAZŠIRJENOSTI IN RAZPONU NADMORSKIH VIŠIN POJAVLJANJA DALMATINSKEGA RJA VČKA, *PROTEREBIA AFRA DALMATATA* (GODART, [1824]) (LEPIDOPTERA: SATYRINAE) NA HRVAŠKEM

Med raziskavami favne metuljev dalmatinskih hribov v zadnjih letih smo vrsto *Proterebia afra dalmata* (Godart, 1824) našli na več novih lokalitetah, vključno s prvimi najdbami te podvrste na višjih nadmorskih višinah (gore Poštak, Svilaja, Promina, Kamešnica in Dinara). V članku predstavljamo veliko popolnejšo sliko razširjenosti tega domnevno redkega metulja in razpravljamo o njegovi višinski razširjenosti. Vrsto smo našli na skoraj 1500 m višine, zato moramo zavreči opredelitev vrste kot nižinske.

KLJUČNE BESEDE: *Proterebia afra dalmata*, Dalmacija, razširjenost, višinski razpon

Introduction

The genus *Proterebia* is monotypic with the distribution in Europe restricted to Greece (subspecies *Proterebia afra pyramus* de Louker & Dils, 1987), Russia south of the Urals (nominata subspecies), Crimea in Ukraine (subspecies *Proterebia afra krymaea* (Sheluzhko, 1929)) and Croatia (subspecies *Proterebia afra dalmata* (Godart, 1824)) (Tolman & Lewington 2008, Tshikolovets 2003).

P. afra dalmata is one of a few butterfly subspecies endemic to Croatia aside from *Erebia stirijs kleki* Lorković, 1955, *E. stirijs gorana* Lorković, 1985 and *E. gorge vagana* Lorković, 1955. Until 20 years ago its distribution in Croatia was very poorly known with records only from the surroundings of Zadar, Šibenik, Knin (Godart 1824; Stauder 1919–1927; Hafner 1994), and unknown locality on Korčula Island (Jakšić 1993). Over the past 10 years a lot of new data about the distribution of this species was published (Čelik *et al.* 2005; Mihoci & Šašić 2005, Zakšek, 2005; Mihoci & Šašić 2007) and eliminated many distribution gaps and expanded its known range from the Pag Island in the northwest to Biokovo Mts. in the South.

Dalmatian Ringlet flies from April to May in one generation (Tolman & Lewington 2008). *P. afra dalmata* is present predominantly in the Sub-Mediterranean region (with the exception of the unconfirmed record from the island of Korčula) (MIHOCI & ŠAŠIĆ, 2005). According to Horvatić (1971) the whole zone is characterized by unique climazonal vegetation of the association of *Quercus-Carpinetum orientalis croaticum*. Continental habitats of this species include overgrown submediterranean grassland community *Festuco-Koelerietum splendidis* or its progressive early succession stage with *Juniperus oxycedrus* on abandoned pastures (Čelik *et al.*, 2005).

While the Greek endemic subspecies *P. afra pyramus* is known to fly in the mountains ranging from an altitude of 600 m a.s.l. up to 1250 m a.s.l. (De Louker & Dils 1987; Abadijev 2002, Tolman & Lewington 2008) the Croatian subspecies, *P. afra dalmata* was believed to be confined to lower altitudes between 150 and 550 m a.s.l. (Tolman & Lewington 2008). According to Mihoci & Šašić (2005, 2007) the species flies up to 700 m a.s.l. (Donji Stublac, Biokovo Nature Park) and was found also almost at the sea level on island Pag (Zakšek 2005). Nevertheless the true altitudinal range of this subspecies was never a target to any systematic survey.

During the surveys of butterfly fauna of Dalmatia from 2005 onwards and targeted surveys of the Dalmatian mountains (Poštak, Prezid, Svilaja, Kamešnica, Dinara, Promina) in April and May 2010 *P. afra dalmata* was found on several new localities, including the first records of the subspecies at higher altitudes. In this paper we present new records of *P. afra dalmata* in Croatia and discuss conservation status, habitat preferences and altitudinal distribution of this subspecies.

Materials and methods

From the year 2005 onwards *P. afra dalmata* was found on 78 more or less distinct localities in central Dalmatia (Tab. 1, Fig. 1). Majority of these finds are from

new localities, only a few are confirmations of the known sites like the record from Vrelo Zrmanje, where it was found by Mihoci & Šašić (2007).

Specimens were caught by an entomological net, determined using Tolman & Lewington (2008) field guide, photographed and released on the same spot. Systematic follows Fauna Europaea (<http://www.faunaeur.org/>). For all known localities from the literature, an approximate altitude was determined using Google Earth tools, while for the new localities the altitude was determined using Garmin e-Trex vista GPS device.

Results

During surveys in the last years in central Dalmatia, *P. afra dalmata* was found on more than 60 new sites including the first records from five separate mountains: Poštak, Svilaja, Promina, Kamešnica and Dinara.

Additional records come from the Island of Pag, where the species seems to be widespread in open stony pastures from Novalja in the north to Povljan in the south. Despite similar suitable habitats on the mainland just south of the island and on nearby Vir Island, the species was not found there (Verovnik R., pers. observ.). Further southeast the butterfly is again common around Obrovac and further inland along Zrmanja and Krupa River valleys with isolated occurrence in Karišnica valley to the west. In this region the species was often observed in more humid habitats, on meadows along rivers, however the densities were mostly low, possibly indicating that these habitats are utilized by the species for occasional nectaring.

One of the main centers of the distribution of *P. afra dalmata* is the region SE of Zadar, around Benkovac, stretching as far south as hinterland of Šibenik. In this region the species was present almost in all suitable habitats, sometimes even entering the gardens in villages. Additional records confirm its contiguous presence also further south, especially around Primorski Dolac and as far as the slopes above Split and Trogir. The butterfly was particularly abundant on the ridge at Miljačka pass on 28.4.2007. Its distribution is probably more contiguous also further inland towards Dрниš, another center of the distribution of the species.

However, the most prominent new findings are from the mountain ranges in Dalmatia which are presented in more detail:

1. Svilaja is a mountain in Dalmatinska Zagora, parallel with the higher northern mountain range Dinara - Troglav. The highest peak of Svilaja is Bat (1508 m a.s.l.) (Poljak 2007). The large part of Svilaja, between Vrljka and Siverić is still covered with land-mines, so only some lower parts of the mountain are accessible and safe. On Svilaja, only a few specimens of *P. afra dalmata* were observed close to the main road at altitudes between 1050 and 1075 m. Butterflies were flying in typical habitat, on dry, grassy, sparsely bushy slopes partially covered with *Juniperus* bushes (Čelik et al. 2005) and were observed feeding on *Thymus* sp. and *Globularia* sp. plants.

2. Poštak is a mountain located south-east of Gračac. Its highest peak is Kučina Kosa (1441 m a.s.l.) (Poljak 2007). On Mt. Poštak *P. afra dalmata* was found near the highest peak at 1425 m a.s.l. and at the southern slopes at 1320 m a.s.l. Only few

specimens of *P. afra dalmata* were observed flying, but that could be attributed to the cloudy weather.

3. The Mt. Vela Promina is located west of Drniš. Unfortunately most of it is still covered with land-mines, so the only safe places to visit are the road to the peak and a small fenced area at the peak of Vela Promina, Čavinica. On Vela Promina *P. afra dalmata* was found near the road to the peak, on rocky slope covered with *Juniperus* bushes and on the peak itself, at 1148m. Only few specimens were observed on both locations.

4. The Dinara Mountain, with its peak Sinjal (1831 m a.s.l.), is the highest mountain in Croatia (Poljak 2007). It stretches from the northwest to southeast, between the Cetina River and Livanjsko polje. The southeastern part of the Dinara mountain range touches the Kamešnica Mountain. On Dinara *P. afra dalmata* was recorded in a continuous row of locations from the mountain hut Glavaš (561 m a.s.l.) to Martinova Košara (1300 m a.s.l.). It is interesting to note that *P. afra dalmata* was very abundant here and could be considered as a dominant species in suitable habitats. Due to bad weather conditions higher altitudes on the Dinara Mountain were not visited.

5. Mt. Kamešnica is located on the border with Bosnia and Herzegovina, north-east of Sinj. *P. afra dalmata* was recorded at three locations on the S side of the mountain at altitudes ranging from 780 to 1350 m a.s.l. in typical stony habitat.

Discussion

The new observations of *P. afra dalmata* fill many distribution gaps and possibly show the main shape of the area of its distribution in Croatia. The only prominent outlier, the record for Korčula Island without exact locality (Jakšić 1993), still remains to be confirmed. However, there are hardly any suitable habitats present on that island therefore the survey of the open stony areas along the main ridge of Pelješac Peninsula could prove much more rewarding. One of the unconfirmed localities remains Zadar, however this record could have been just a generalization of a find in a wide surrounding of the town (even as distanced as Benkovac region) or a genuine record from a site where the suitable habitats are now overgrown or destroyed by infrastructure. All other literature records are more or less in the vicinity of recent finds and well within the known distribution range (Fig. 1).

Recent finds only marginally extend the known range of the species further southeast to Župa and northwest on the Pag Island. Within the range the species is much more common and widespread as it was previously believed. So far the species has been recorded from more than 60 discrete sites excluding old records without information on exact locality. The main centers of distribution are around the Zrmanja River, region between Benkovac and Šibenik, and hills north of Split. The most prominent new records are from the mountains in the hinterland of Dalmatia where the species was found at higher altitudes than previously recorded.

The altitudinal span (Fig. 2) of the species is now much expanded with records above 1400 m. Occurrence of the species at such altitudes has for now been known only from Turkey (Hesselbarth et al. 1995) and its range in Central Asia (Tuzov et al. 1996), but also in Greece the records at altitudes of 1250 m (De Louker & Dils 1987)

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Fig. 1. Distribution of Dalmatian Ringlet (*P. afra dalmata*) in Croatia. Grey spots represent old records, black spots represent new ones.

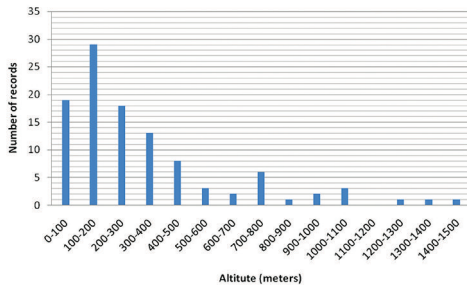


Fig. 2. Number of records of Dalmatian Ringlet (*P. afra dalmata*) in each of the altitudinal class (divided into 100 m intervals for convenience).

are of similar range. Currently the upper bound of the species in Croatia is at the peak of Mt. Poštak (1426 m a.s.l.); however its upper limit on Mt. Dinara was not explored and, given the suitable habitat, could be much higher. The majority of the records however are from lower altitudes, especially between 0 and 400 m. This can be easily explained by the fact that all but a few main distribution centers of the species are near the coast. This does not indicate the colline nature of *P. afra dalmata*, as the suitability of the habitat is possibly the only limiting factor of the distribution of the species. The distribution of the potentially suitable habitat which extends along the Adriatic coast and enters the Dalmatian mountains (Horvatić, 1971) is however much wider and additional surveys of suitable habitats elsewhere are much needed.

The habitats of the species observed during the field work varied between almost completely barren pastures on the Island of Pag, to almost entirely overgrown grasslands in the hinterland between Benkovac and Šibenik. Additionally, the species was found on montane grasslands and utilizing wet, flower rich meadows for nectaring. Despite this variability of habitats we fear that continuation of abandonment, resulting in conversion of grasslands into woods, could cause large scale local extinctions and thus contraction of the subspecies range. Such processes were clearly visible during the surveys with low species abundances at sites with more advanced bush coverage.

New records clearly indicate how little we really know about the ecology of *P. afra dalmata* and how much we still have to learn. The large number of new records is also a good indication of the lack of systematic surveys due to limited number of researches and lack of funding. After “Distribution maps of the butterflies of Yugoslavia” (Jakšić 1988) no real effort was done to map the butterflies of Croatia, and produce a correct and modern distribution atlas of Croatian butterflies, so the distribution of most species in Croatia is still poorly known. Therefore we hope to

trigger further research on the Dalmatian Ringlet and more generally, a concerted effort of mapping of butterfly distribution in Croatia.

Table 1. New records of the Dalmatian Ringlet (*Proterebia afra dalmata*) in Croatia. Localities are sorted in descending order from the highest a.s.l. to the lowest.

Locality	Coordinates		Alt. (m)	Date	Observer(s)
Poštak, Kučina Kosa	44°15'18.67"N	16°06'42.93"E	1441	May 19th, 2010	Koren, Burić, Štiš
Kamešnica, Me ugorje	43°41'58.44"N	16°52'11.15"E	1350	May 24th, 2010	Koren, Burić, Štiš
Dinara, Martinova kosara	44°02'20.72"N	16°24'39.04"E	1300	May 25th, 2010	Koren, Burić, Štiš
Dinara, above Glavaš	44°02'12.97"N	16°24'53.41"E	1175	May 26th, 2010	Koren, Burić, Štiš
Velika Promina, Cavinica	43°55'27.49"N	16°10'12.13"E	1148	May 23rd, 2010	Koren, Burić, Štiš
Dinara, above Glavaš	44°02'14.79"N	16°25'11.03"E	1130	May 26th, 2010	Koren, Burić, Štiš
Kamešnica, near the white road	43°42'26.36"N	16°51'15.01"E	1085	May 24th, 2010	Koren, Burić, Štiš
Svilaja, above the main road	43°51'27.89"N	16°23'59.95"E	1075	May 20th, 2010	Koren, Burić, Štiš
Dinara, above Glavaš	44°01'22.83"N	16°24'55.97"E	925	May 26th, 2010	Koren, Burić, Štiš
Dinara, above Glavaš	44°01'13.45"N	16°01'13.45"E	800	May 26th, 2010	Koren, Burić, Štiš
Kamešnica, Korita	43°42'26.42"N	16°48'24.68"E	780	May 24th, 2010	Koren, Burić, Štiš
S slopes N from village Župa, Zagvozd	43°20'15.10"N	17°07'01.30"E	758	April 3rd, 2007	Zakšek, V.
Vrelo Zрманje, near Marčetići	44°13'58.74"N	16°04'10.60"E	722	May 1st, 2010	Koren, Burić, Štiš
Above village Otrić	44°15'43.51"N	16°02'42.51"E	720	May 25th, 2010	Koren, Burić, Štiš
Dinara, Glavaš	44°00'33.88"N	16°25'01.65"E	561	May 26th, 2010	Koren, Burić, Štiš
S of Drežnica, Mirlović polje, Driš	43°48'45.80"N	16°21'48.00"E	552	May 2nd, 2007	Zakšek, V.
N from village Svaguš, Zagvozd, Grabovac	43°25'06.70"N	17°01'21.70"E	485	April 30th, 2007	Zakšek, V.
E from village Milići, Lovrinčevići, Zagvozd	43°22'57.90"N	17°04'21.00"E	473	April 30th, 2007	Zakšek, V.
Split, Gornje Kelami, on the pass north of the village east of Mt. Biluš	43°37'54.08"N	16°20'21.04"E	459	April 28th, 2007	Verovnik, R.
W from G. Buljani, D. Bitelić, Hrvace, Sinj	43°47'46.80"N	16°35'50.70"E	431	April 29th, 2007	Zakšek, V.
W of Janjići, Mirlović polje, Driš	43°48'26.30"N	16°20'40.80"E	406	May 2nd, 2007	Zakšek, V.
NW from spring M. Rumin, Rumin, Hrvace, Sinj	4°46'56.90"N	16°39'06.20"E	393	April 29th, 2007	Zakšek, V.
W of hill Lisnica, Sirovice, Driš	43°50'47.30"N	16°09'06.30"E	383	May 2nd, 2007	Zakšek, V.
SW of G. Planjane, Unešić, Driš	43°44'44.80"N	16°11'43.80"E	359	May 2nd, 2007	Zakšek, V.
SE of village Parati, D. Planjane, Driš	43°46'54.30"N	16°10'03.30"E	340	May 2nd, 2007	Zakšek, V.
Ravni Golubići, near the pond	44°11'47.40"N	15°49'25.03"E	340	May 6th, 2010	Koren, Burić, Štiš
Beneš Zрманja village	44°09'45.71"N	16°03'25.49"E	320	May 1st, 2010	Koren, Burić, Štiš
Trogir, Prgomet, carstic plateau Muše on a small road from E side	43°36'12.55"N	16°13'13.78"E	312	April 28th, 2007	Verovnik, R.
Vrelo Zрманje, Bogunovići	44°12'12.31"N	16°04'19.08"E	303	May 4th, 2010	Koren, Burić, Štiš
Golubići, close to the Mt. Prezid	44°06'19.68"N	16°12'51.58"E	298	April 30th, 2010	Koren, Burić, Štiš
W of hill Brušnjak, Višići, Sitno Donje, Primorski Dolac	43°41'14.50"N	16°09'44.80"E	288	May 2nd, 2007	Zakšek, V.
Mokro polje	44°03'29.07"N	16°02'34.51"E	286	May 1st, 2010	Koren, Burić, Štiš
W from Dirljići, Radošić, Trogir	43°36'40.90"N	16°16'27.80"E	280	May 2nd, 2007	Zakšek, V.
Kaštel, Kozjak, on a small side road westwards to spring Češmenovac	43°34'37.10"N	16°19'26.55"E	257	April 28th, 2007	Verovnik, R.
E of hill Vrljica, Bakovići, Primorski Dolac	43°39'11.20"N	16°12'07.90"E	235	May 2nd, 2007	Zakšek, V.
Split, Radošić, along the road N of the crossroads	43°36'27.83"N	16°19'44.35"E	234	April 28th, 2007	Verovnik, R.
S of hill Mrčelin umac, Sitno Donje, Primorski Dolac	43°41'48.20"N	16°09'22.70"E	227	May 2nd, 2007	Zakšek, V.
Šibenik, Danilo, western part of the hill Baljčuš	43°43'39.21"N	15°59'06.83"E	223	April 28th, 2007	Verovnik, R.
SE of Goriš, Konjevrate, Driš	43°47'37.50"N	16°01'54.50"E	220	May 2nd, 2007	Zakšek, V.
Kaštel, Rudine, small valley with a road to Opor north of railroad	43°34'18.73"N	16°18'19.97"E	202	April 28th, 2007	Verovnik, R.
W from hill Vjenac, Nadin, Benkovac	44°07'55.56"N	15°51'79.72"E	202	April 30th, 2005	Zakšek, V.
Primorski Dolac, Troločke, on the plateau west of the village	43°37'55.90"N	16°14'30.12"E	192	April 28th, 2007	Verovnik, R.
SW from village Mikulići, Benkovac	44°01'19.80"N	15°35'42.20"E	176	April 30th, 2005	Zakšek, V.
Hills Kozarica and Kaštelina, Kašić, Pirovac	43°52'07.90"N	15°40'02.60"E	161	May 1st, 2005	Zakšek, V.
N from village Raštevici, Polača, Benkovac	44°03'01.00"N	15°31'58.90"E	156	April 30th, 2005	Zakšek, V.
SW of Gulin, Bilice, Šibenik	43°46'31.70"N	15°57'40.70"E	154	May 2nd, 2007	Zakšek, V.
Obrovac, in the village Bogatnik at Šukare	44°09'43.85"N	15°49'13.01"E	153	March 3rd, 2008	Verovnik, R.
W from hill V. Umac, Crljenik, Pirovac	43°52'48.70"N	15°40'54.60"E	151	May 1st, 2005	Zakšek, V.
Krupa spring, close to the road	44°11'46.67"N	15°54'35.14"E	143	April 30th, 2010	Koren, Burić, Štiš

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Locality	Coordinates		Alt. (m)	Date	Observer(s)
NW from village Begovići, Benovac	44°02'26.80"N	15°32'48.00"E	142	April 30th, 2005	Zakšek, V.
Panići, near the road to vrelo Krupe	44°10'46.45"N	15°49'18.04"E	133	May 2nd, 2010	Koren, Burić, Štih
Obrovac, along the road S of the town on the plateau	44°11'41.90"N	15°40'26.09"E	132	March 3rd, 2008	Verovnik, R.
W of village Gornja Jagodnja, Polača, Benkovac	44°00'52.00"N	15°32'00.32"E	129	April 30th, 2005	Zakšek, V.
SW from Komorovac, Novalja, Island of Pag	44°34'00.00"N	14°55'55.10"E	127	April 28th, 2005	Zakšek, V.
W of Donje Miranje, Vrana, Pakoštane	43°58'50.70"N	15°34'59.70"E	126	April 30th, 2005	Zakšek, V.
Hills Stubica and Drašnjak, Čubrići, Pirovac	43°51'23.40"N	15°41'28.30"E	124	May 1st, 2005	Zakšek, V.
Sekulići, behind the cemetery	44°13'04.57"N	15°44'40.41"E	120	May 3rd, 2010	Koren, Burić, Štih
W from village Zapužane, Benkovac	44°00'55.50"N	15°33'43.00"E	118	April 30th, 2005	Zakšek, V.
E from village Ivkovići, Nadin, Škabrnja, Benkovac	44°04'46.30"N	15°46'30.15"E	116	April 30th, 2005	Zakšek, V.
Obrovac, Krupa gorge, 2 km SE of the Krupa Monastery	44°11'25.62"N	15°52'28.34"E	115	March 3rd, 2008	Verovnik, R.
S from village Čubrići, Pirovac	43°51'30.00"N	15°42'00.40"E	114	May 1st, 2005	Zakšek, V.
Obrovac, along the road 0.5 km N of the turn for village Ribnica	44°10'48.01"N	15°37'02.61"E	111	March 3rd, 2008	Verovnik, R.
Obrovac, Krupa, grasslands SE of the Krupa Monastery	44°11'32.36"N	15°53'09.82"E	103	March 3rd, 2008	Verovnik, R.
E of village Ražnjevići, Polača, Benkovac	44°01'10.10"N	15°31'21.80"E	101	April 30th, 2005	Zakšek, V.
Manastir, close to river Krupa	44°11'26.33"N	15°53'00.17"E	101	May 2nd, 2010	Koren, Burić, Štih
Pastures between Kolansko blato and Kolan, Novalja, Island of Pag	44°29'57.70"N	14°56'20.50"E	84	April 27th, 2005	Zakšek, V.
E from village Vidalići, Novalja, Island of Pag	44°32'12.60"N	14°57'47.80"E	77	May 2nd, 2005	Zakšek, V.
Kaštel Žegarski, village	44°09'24.14"N	15°51'12.23"E	75	April 30th, 2010	Koren, Burić, Štih
N of Smokvica, Poveljana, Island of Pag	44°22'12.50"N	15°12'00.20"E	71	April 30th, 2005	Zakšek, V.
S from hill Bakrač, near Vrana lake, Pirovac	43°51'58.20"N	15°38'55.50"E	67	May 1st, 2005	Zakšek, V.
N from marine Šimuni, Pag, Island of Pag	44°28'28.60"N	14°57'17.30"E	65	April 28th, 2005	Zakšek, V.
N of hill Kosovac, Vrana, Pakoštane	43°56'15.00"N	15°34'20.70"E	40	April 30th, 2005	Zakšek, V.
NW of Bošana, Pag, Island of Pag	44°28'49.90"N	15°00'03.80"E	22	April 28th, 2005	Zakšek, V.
Turnić, S from Gorica, Poveljana, Island of Pag	44°22'47.74"N	15°07'16.52"E	20	April 28th, 2005	Zakšek, V.
Stan, NW of Vlašići, Poveljana, Island of Pag	44°21'25.70"N	15°07'02.10"E	16	April 28th, 2005	Zakšek, V.
Karin, Karišnica valley, middle part	44°07'13.15"N	15°37'43.30"E	14	March 3rd, 2008	Verovnik, R.
Binjac, SE from Košljun, Pag, Island of Pag	44°23'15.69"N	15°06'14.04"E	6	April 28th, 2005	Zakšek, V.
Drakovci, E from Poveljana, Island of Pag	44°21'34.80"N	15°08'15.40"E	5	April 28th, 2005	Zakšek, V.

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Received / Prejeto: 16. 9. 2010

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Zeitschrift/Journal: [Acta Entomologica Slovenica](#)

Jahr/Year: 2010

Band/Volume: [18](#)

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Artikel/Article: [NEW DATA ABOUT THE DISTRIBUTION AND ALTITUDINAL SPAN OF THE DALMATIAN RINGLET, PROTEREBIA AFRA DALMATA \(GODART, \[1824\]\) \(LEPIDOPTERA: SATYRINAE\) IN CROATIA 143-150](#)