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SPECIES RELATED TO *CHEILOSIA CANICULARIS* (DIPTERA: SYRPHIDAE) ON THE BALKAN PENINSULA

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The paper deals with three species from *Cheilosia canicularis* complex: *C. himantopus* (Panzer, 1798), *C. canicularis* (Panzer, 1801) and *C. ortotricha* Vujić and Claussen, 1994, that occur on the Balkan Peninsula. All available distribution data and results from morphological studies are summarized for these three species. Field studies showed that the biology of *C. canicularis* and *C. himantopus* is very similar.

KEY WORDS: *Cheilosia canicularis*, Balkan Peninsula, SEM, Diptera, Syrphidae

INTRODUCTION

The genus *Cheilosia* (Syrphidae: Cheilosinii) contains over 470 species worldwide (STAHLS & NYBLOM, 2000). The group of species closely related to *Cheilosia canicularis* includes 5 taxa that are restricted to the Palaearctic Region: *C. himantopus* (Panzer, 1798), *C. canicularis* (Panzer, 1801), *C. ortotricha* Vujić and Claussen, 1994, *C. japonica* (Herve-Bazin, 1914) and *C. yesonica* Matsumura, 1905. These five species are characterized by the following characters: (1) eyes slightly hairy in lower part (1/3 – ½), (2) face tubercle forming a wide knob with small side humps, (3) arista long, (4) thorax covered with long hairs, and (5) tibiae and tarsi mostly pale (SMIT et al, 2001). *C. japonica* and *C. yesonica* are endemic to Japan, while *C. himantopus*, *C. canicularis* and *C. ortotricha* are widespread Palaearctic species (STUKE & CLAUSSEN, 2000) that have been collected from the Balkan Peninsula.

Adult (VUJIĆ & CLAUSSEN, 1994) and larval (STUKE, 2000) morphology and DNA sequences (STUKE & BRUCKNER, 2001) can be used to separate *C. ortotricha* from *C. himantopus* and *C. canicularis*. STUKE & BRUCKNER (2001) conducted

phylogenetic analyses of six species of European *Cheilosia* using a combined cytochrome oxidase II mtDNA and tRNA dataset. The species *C. himantopus*, *C. canicularis*, and *C. ortotricha* formed a clade, and the lowest interspecific divergence found among the six *Cheilosia* species was between *C. himantopus* and *C. canicularis* (0.7%, corresponding to a difference in five nucleotides). Their study demonstrated a close phylogenetic relationship between these two species, which is emphasized by an intraspecific divergence of 0.3% (two nucleotides) between a larva and imago from separate populations of *C. canicularis* (STUKE & BRUCKNER, 2001). Based on biology and larval and adult morphology, *C. himantopus* and *C. canicularis* were considered two separate species by STUKE & BRUCKNER, 2000.

The aims of this study were to evaluate the use of diagnostic characters published for *C. canicularis* and related species collected from the Balkan Peninsula and to find new diagnostic features for *C. himantopus* and *C. canicularis* using scanning electron microscopy. This paper also reports results from field studies conducted to improve biological characterizations for *C. himantopus*, *C. canicularis* and *C. ortotricha*.

MATERIAL AND METHODS

Using the diagnostic characters given by STUKE & CLAUSSEN (2000) and VUJIĆ & CLAUSSEN (1994) to distinguish the species of the *canicularis* group, we examined specimens from collections of Department of Biology and Ecology, Faculty of Sciences at Novi Sad (IBNS); Bosnia and Herzegovina Museum, Sarajevo (BHMS); Slovenian Natural History Museum, Ljubljana (SNHM); and Croatian Museum of Natural History, Zagreb (CNHM).

A scanning electron microscope (SEM), model JEOL JSM 35, was used to examine the arista, tergites I-III and postalar kalus cuticle surface of 32 specimens. Besides 25 specimens of *C. himantopus* and *C. canicularis* from nine regions of the Balkan Peninsula (eight mountains: Slovenian Alps, Durmitor, Kopaonik, Jahorina, Kožuf, Stara planina, Šar planina, Fruška Gora and Voivodina plain), five specimens of *C. himantopus* and *C. canicularis* from Durmitor (Montenegro), Kopaonik (Serbia) and Gorski Kotar (Croatia) with intermediate morphological features were examined. Two specimens of *C. ortotricha* were examined for additional comparisons, and a total of 30 SEM photographs characteristic of arista and tergites I-III surface were made.

50 larvae were collected from *Petasites hybridus* on Fruška gora mountain in Serbia (at Paragovo, 13. 03. 2000 and 31. 03. 2002). Larvae were boiled and preserved in 70% alcohol and determined using an identification key to *Cheilosia* larvae (STUKE, 2000). The structure of anal segment cuticle, which was used as diag-

nostic character, was more visible when larvae were dried after boiling, so boiled larvae were left on tissue paper for seven days and than put in plastic boxes. In order to observe the development of the larvae, six *C. himantopus* and three *C. canicularis* specimens were brought in laboratory with parts of host plant.

In the section "Results and discussion" collecting data were given using the following format: country, geographical landform (for example, mountain), locality, UTM mark, date of collecting, number of males (m), number of females (f), legators. Distribution maps are also provided in the section "Results and discussion" for *C. canicularis*, *C. himantopus* and *C. ortotricha* collected from the Balkan Peninsula.

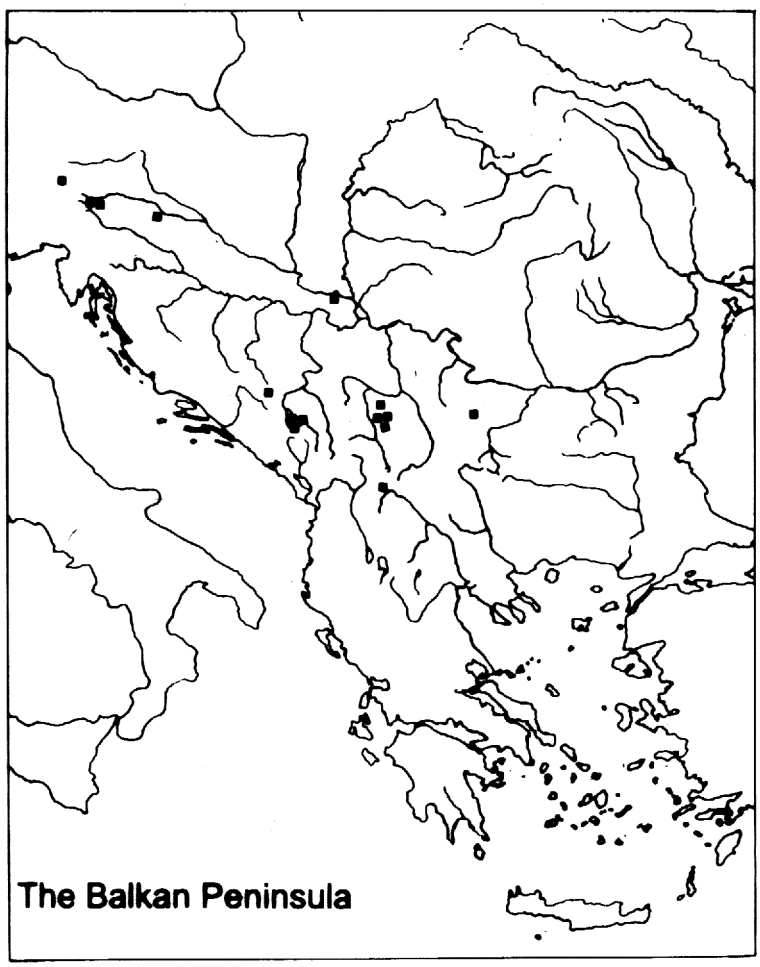
RESULTS AND DISCUSSION

COLLECTIONS

***Cheilosia canicularis* (Panzer, 1801)**
Unverified references: Glumac, 1955a, 1959; Coe, 1960; Bankowska, 1967; Kula, 1985
Verified data: Strobl, 1898; Šimić, 1987; Vujić, 1996 (in part)
Erroneous data: Glumac, 1955b, 1968 (= *Cheilosia himantopus*); Vujić, 1996 (in part = *Cheilosia himantopus*)

Examined material (Map 1)
Published records: Strobl, 1898; Bosnia Herzegovina: Tresk. (Treskavica) BP82, 1♀, leg. Strobl (BHMS); **Šimić, 1987: Montenegro:** Durmitor, Luke-Skakala CN37, 24.viii.1984, 1♀, leg. Šimić S, Vujić A, Motički Gaj CN47, 8.viii.1982, 1♀, leg. Šimić S, Vujić A, Ercegovac Lj, (IBNS); **Vujić, 1996: Slovenia:** Kamniška Bistrica VM63, 16.vi.1988, 1♀, leg. Radnović D, Vujić A, Vršič VM04, 18.vi.1988, 1♀, leg. Radnović D, Vujić A (IBNS); **Croatia:** Krapina WN61, 1♀, leg. dr. Hansch (BHMS); **Montenegro:** Durmitor: Škrčka jezera CN37, 9.viii.1985, 1♀, leg. Vujić A, Kanjon Sušice CN38, 26.vi.1987, 1♂, leg. Vujić A, 9.vii.1991, 1♀, leg. Radnović D, Stolić S, Vujić A, **Serbia:** Kopaonik: Treska-Bukva DN89, 17.vii.1985, 1♂, 1♀, leg. Vujić A, Karamanski potok (Marine vode) DN89, 20.vii.1985, 1♂, 1♀, leg. Vujić A, 15.viii.1985, 1♀, leg. Vujić A, 7.vii.1986, 1♀, leg. Radišić P, Radnović D, Vujić A, Samokovska reka DP70, 19.vii.1985, 1♀, leg. Vujić A, 5.vii.1986, 1♀, leg. Radišić P, Radnović D, Vujić A, 3.viii.1987, 1♂, leg. Vujić A, Gobeljska reka DP80, 4.viii.1987, 5♀, leg. Vujić A, Jankove bare DN 89, 2.viii.1987, 1♂, leg. Vujić A, Duboka Reka DN89, 16.viii.1985, 1♂, 2♀, leg. Vujić A, 6.vii.1986, 1♂, leg. Radišić P, Radnović D, Vujić A, Žljeb DN89, 6.vii.1986, 1♂, leg. Radišić P, Radnović D, Vujić A,; Stara Planina: Arbinje FN49, 11.viii.1987, 5♂, 2♀, leg. Vujić A; Goč, Dobre Vode DP82, 8.-11. viii 1983, 2♀, leg. Vujić A, Tara, 14.viii.1982, 1m; **FRY Macedonia:**

Sar Planina, Lešnica-Popova Sapka DM85, 27.vii.1986, 2♀, leg. Božičić B, Vujić A (IBNS).
New records: Slovenia: Velika planina VM91, 18.viii.1974. 1♀, leg. Sivec I (SNHM); **Bosnia Herzegovina:** Tresk. (Treskavica) BP82, 1812, 4♀, leg. Wgth, Tresk. planina (Treskavica) BP82, 8♀, leg. Apfelbeck, 1♀, leg. Schneereg (BHMS); **Montenegro:** Durmitor: Škrčko ždrijelo-jezero CN37, 2.ix.1997, 1♀, leg. Vujić A, Škrčko jezero CN37, viii.1997, 1♀, leg. Vujić A, Krecmani CN37, 30.vii.1998, 2♂, 8♀, leg. Milenković D; **Serbia:** Fruška Gora, Glavica DR00, 7.ix.2001, 1♂, leg. Šikoparija B; Kopaonik, 7.vi.1998, 1♀, Samokovska reka DP70/80, 14.viii.1997, 2f; leg. Prodana J, Karaman-Čukara DN89, 14-16.viii.1997, 3f (IBNS).



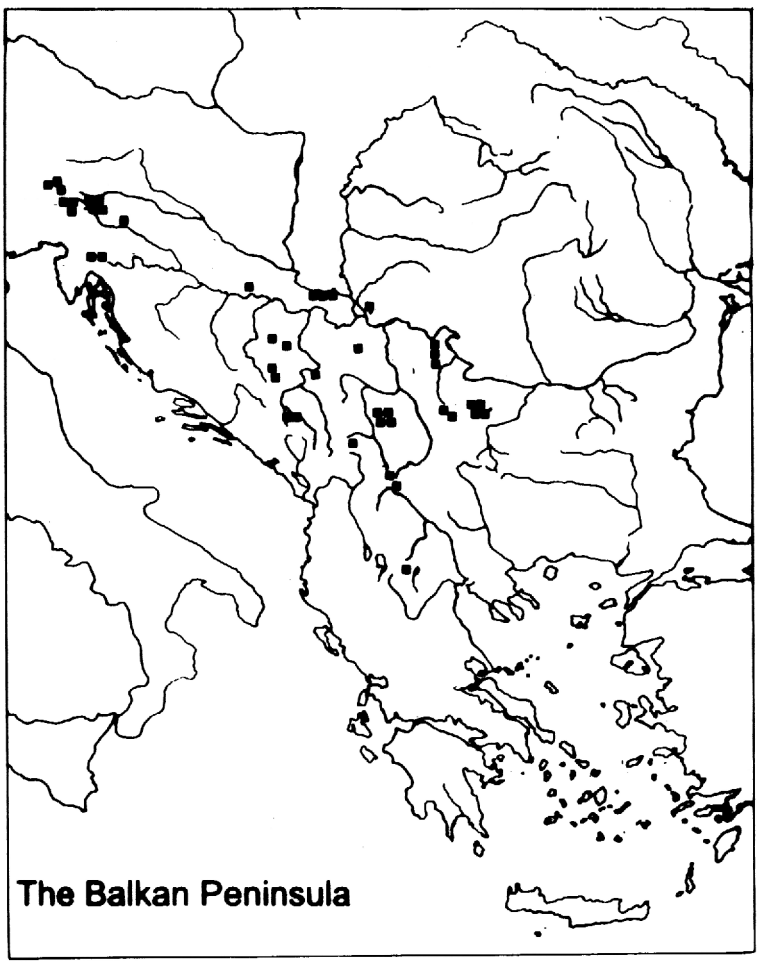
Map. 1. Distribution of *Cheilosia canicularis* on the Balkan Peninsula

Additional material: Austria: Bezirk Paznaun; SE Kappl Grubletal, 1800♂, 21.vii.1986, 1♀, leg. Claussen C, West-Tirol, Paznauntal, N See, Umg. Falgenar, 1200-1300♂, 26. vii 1986, 1♂, leg. Claussen C; **USA:** La Quinta, 8.iii.1992, 1m leg. Božičić B (IBNS).

***Cheilosia himantopus* (Panzer, 1798)**
Cheilosia trisulcata of Glumac, 1955b
Cheilosia canicularis of Glumac, 1955b, 1968; Vujić, 1996 (in part)

Examined material (Map 2)
Published records: Glumac, 1955b: Bosnia Herzegovina: Stambulčić CP05, 5.16. 2♀, leg. Apfelb, (1f det. Glumac as *Cheilosia canicularis*; 1f det. Glumac as *Cheiloisa trisulcata*) (BHMS); **Glumac, 1968** (as *Cheilosia canicularis*)**: FRY Macedonia:** Šar Planina, dolina potoka na *Roripa sp,* 28.v.1960**,** 1m 1♀, leg. Glumac S; Vata Bogunović EM16, livada na cvetu *Ranunculus sp*. 7.vi.1959, 2♀, leg. Glumac S (IBNS); **Vujić, 1996** (as *Cheilosia canicularis*)**: Slovenia:** Julijske Alpe: Soča VM04, UM94, 23.v.1989, 1♂, leg. Vujić A, Pokljuka VM13, 22.v.1989, 1♂, leg. Vujić A, Bled-Bohinj VM23, 14.vi.1989, 4♂, leg. Radnović D, Vujić A, Bohinjska-Bistrica VM12, 14.vi.1988, 5♀, leg. Radnović D, Vujić A, Bohinjska Bistrica-Savica VM02, 25.v.1989, 2♂, leg. Vujić A, Bohinjsko jezero–Črno jezero (Savica), 2.vii.1989, 1f leg. Vujić A, Mežakla VM24, 18.vi.1988, 1♀, leg. Radnović D, Vujić A, Vršić VM04, 18.vi.1988, 2♂, leg. Radnović D, Vujić A, Vršić-Kranjska Gora VM04, 23.v.1989, 3♂,1♀, leg. Vujić A; Kamniške i Savinjske Alpe: Dreta VM82, 16.vi.1988, 1♂, leg. Radnović D, Vujić A, Kamniška Bistrica VM63, 16.vi.1988, 5♂, 3♀, Radnović D, Vujić A, 21.v.1989, 7♂, 5♀, leg. Vujić A, 30.vi.1989, 1♀, leg. Vujić A, Logarska Dolina VM63/73/74, 17.vi.1988, 6♂, 1♀, leg. Radnović D, Vujić A, 25.v.1989, 4♂,1♀, leg. Vujić A, 1.vii.1989, 1♂, 1♀, leg. Vujić A, Matkov Kot VM64, 25.v.1989, 1♂, 1♀, leg. Vujić A, 1.vii1989, 2♂, 1♀, leg. Vujić A, Savinja VM73, 16.vi.1988, 4♀, leg. Radnović D, Vujić A; Menina: Gornji Grad VM82, 24.v.1989, 6♂, 3♀, leg. Vujić A; **Croatia:** Gorski Kotar: Risnjak VL63/73, 27.v.1990, 6♂, leg. Vujić A, 27.v.1990, 1♀, leg. Vujić A; Slavonski Brod, Dilj BR61, 21.viii.1985, 1♀, leg. Vujić A, Božičić B; **Bosnia Herzegovina:** Jahorina CP04, 26.vi.1989, 2♂, 1♀, leg. Vujić A, 14.vi.1991, 1m leg. Vujić A; Javor (Kladanj), Sokolina CP29, 13.v.1989, 5♂, leg. Vujić A; Konjuh CQ00, 13.v.1989, 2♂, leg. Vujić A, 25.vi.1989, 3♀, leg. Vujić A; **Montenegro:** Durmitor: Luke CN37, 9.vii.1991, 1♂, leg. Radnović D, Stolić S, Vujić A, ka Jablan jezeru CN48, 7.vii.1991, 1♂, leg. Radnivić D, Stolić S, Vujić A, Sušička jezera CN38, 27.vi.1985, 1♀, leg. Vujić A, Škrčka jezera CN37, 9.viii.1985, 1♂, leg. Vujić A, Sušica-Skakala, 25-28.vi.1985, 1♂, 1♀, leg. Vujić A; **Serbia:** Fruška Gora: Andrevlje CR90, 12.iv.1975, 1♀, leg. Šimić S, Stražilovo DR00, 16.v.1982, 1♀, leg. Ercegovac Lj, Ljuba-jezero CR70, 18.v.1985, 1♀, leg. Aleksić D, Vujić A, 11.v.1987. 1♀, leg. Vujić A, Venac DR00, 19.v.1987, 5f ,leg. Vujić A. Brankovac DR00, 19.v.1987, 2♂, 2♀, leg. Vujić A, Stari-Ledinci DR00, 9.v.1988, 1♀, leg. Radnović D, Vujić A, Paragovo DR00, 22.vi.1988, 1♀, leg. Radnović D, Vujić A, Glavica DR00, 1.v.1988, 4♂, 2♀, leg.

Radnović D, Vujić A, 9.v.1988, 1♀, leg. Radnović D, Vujić A, 30.v.1988, 9♀, leg. Radnović D, Vujić A, 22.vi.1988, 3♀, leg. Radnović D, Vujić A, 5.iv.1989, 1♂, 1♀, leg. Milankov V, Radnović D, Radović D, Vujić A, 9.v.1989, 1♀, leg. Milankov V, Radović D, Vujić A, 20.v.1989. leg, 2♀, Vujić A, 22.vi.1989, 1♀, leg. Radović, Vujić A, 25.iv.1989, 8♂, 1♀, leg. Milankov V, Radović D, Vujić A, 30.v.1989, 2♂, 2♀, leg. Milankov V, Radnović D, Vujić A; Dubašnica: Dubašnica-Lunga EP78, 6.vi.1993, 2♂, leg. Radišić P, Radnović D, 5.v.1994, 1♀, leg. Milankov V, Demizlok EP77, 14.v.1994, 1♀, leg. Radnović D, Zlotska klisura (K. Lazareve r.) EP77, 5.vi.1989, 1♀, leg. Radišić P, Radnović D, Vujić A; Malinik (Zlot) EP77, 3.vi.1989, 4♀, leg. Radišić P, Radnović D, Vujić A; Tara, Gorušica



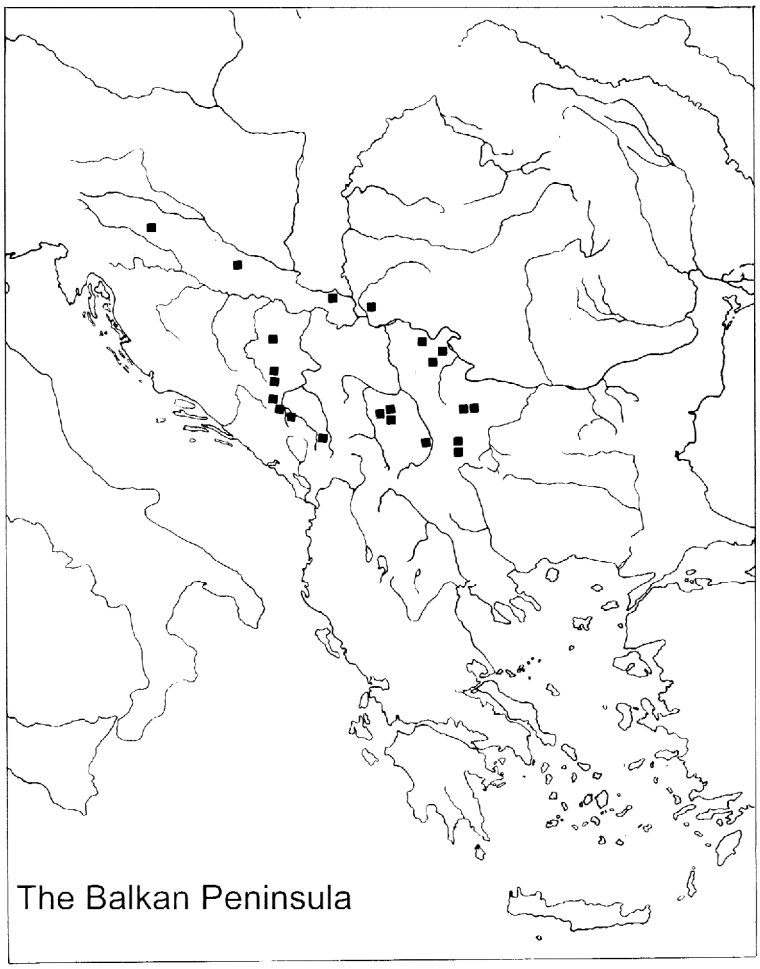
Map. 2. Distribution of *Cheilosia himantopus* on the Balkan Peninsula

CP76, 12.vii.1985, 1♂, leg. Radnović D; Feljesana-Debeli lug EQ71, 28.iv.1989, 2♂, 2♀, leg. Vujić A; Todorova reka EQ71, 28.iv.1989, 8♂, 2♀, leg. Vujić A; Žljeb DN33, 3.v.1991, 1♂, leg. Vujić A; Suva Planina: Čukljenik EN89, 2.v.1988, 1♂, leg. Radnović D, Vujić A, Jelašnica-D. Stud. EN89, 2.v.1988, 1♂, leg. Radnović D, Vujić A, Bojanine vode EN98, 28.v.1988, 1♀, leg. Ercegovac Lj, Vujić A; Stara Planina: Crni vrh FP20, 31.v.1988, 1♀, leg. Ercegovac Lj, Vujić A, Dojkinačka reka 1 i 2 FN48/49, 29-30.v.1988, 4♀, leg. Ercegovac Lj,Vujić A, Dojkinačka reka 2 FN48/49, 29.v.1987, 1♂, leg. Božičić B, Šimić S, Vujić A, Dojkinačka reka 3 FN48/9, 29.v.1987, 3♂, leg. Božičić B, Šimić S, Vujić A, Topli Do FP30, 28.v.1987, 3♂, leg. Božičić B, Šimić S, Vujić A, Planinica FN38, 29.v.1988, 1♀, leg. Ercegovac Lj, Vujić A; Šar Planina, Ošljak DM98, 29.vi.1988, 1♂, leg. Vujić A; Kopaonik: Karamanski potok DN89, 24.v.1986, 3♂, leg. Vujić A, Samokovska reka 1 DN89, 1.v.1986, 4♂, 2♀, leg. Božičić B, Vujić A, Samokovska reka 2, 3 DN70, 22.v.1986, 6♂, 6f ,leg. Radnović D, Vujić A, Samokovska reka DP70, 22.vi.1991, 1♂, leg. Šimić S, Vujić A, Velika reka DN89, 14.vi.1986, 3♂, 4♀, leg. Božičić B, Šimić S, Vujić A, Sunčana dolina DN89, 23. vi.1991, 2♂, leg. Šimić S, Vujić A, Duboka reka DN89, 18.vi.1986, 1♂, leg. Božičić B, Šimić S, Vujić A, Graševci (G. reka) DN99, 24.v.1987, 1♀, leg. Božičić B, Šimić S, Vujić A, Graševačka reka DN99, 27.v.1987, 7♂, 2♀, leg. Božičić B, Šimić S, Vujić A, 21.vi.1987, 1♀, leg. Božičić B, Šimić S, Vujić A, Graševci DN99, 21.vi.1987, 1♀, leg. Vujić A, Vlajkovci, 24.v.1987, 2♂, 13♀, 21.vi.1987, 2♀, Brzećka reka DN 99, 27.v.1987, 1♂, leg. Božičić B, Šimić S, Vujić A, Srebrnac DN80, 24.v.1987, 1♂, leg. Božičić B, Šimić S, Vujić A, Srebrnac 2 DN80, 21.vi.1987, 1♀, leg. Vujić A, Gobeljska reka DP80, 25.v.1987, 1♂, leg. Božičić B, Šimić S, Vujić A, 24.vi.1987, 2♀, leg. Vujić A, Gobeljska reka 2 DP80, 25.v.1987, 2♂, 1♀, leg. Božičić B, Šimić S, Vujić A; **FRY Macedonija:** Kožu♀, Konsko FL06, 14.v.1990, 1♂, 2♀, leg. Vujić A, 19.vi.1990, 1♂, leg. Radnović D, Vujić A (IBNS).
New records: Slovenia: Anže pri. Brestanica WL39/49, 15.v.1976, 2♂, 1♀, leg. Sivec I, Matkov kot, 12.v.1974, 1♂, leg. Sivec I (SNHM); **Serbia:** Ljig DP39, 29.iv.1982, 1♂, leg. Ercegovac Lj; Kopaonik; 7.vi.1998,1f; Fruška Gora: Paragovo DR00, 14.iv.2000, 1♀, leg. Šikoparija B, 19.iv.2000, 1♂, leg. Šikoparija B, 3.v.2000, 1♂, leg. Šikoparija B; Vojvodina, Sefkerin-Opovo DQ85, 23.iv.2000, 1♀, leg. Radišić P; Dubašnica: Klisura Lazareve reke EP77, 29.iv.1995, 1♂, 1♀, 31.v–4.vi.1995, 1♂, Demizlok EP77, 7.vi.1997, 1♀, Lunga EP78, 2.vii.1998, 1m; **Montenegro:** Durmitor: , 20-23.vi.1998, 2♂, 1♀, Kanjon Sušice CN38, 31.v – 2.vi. 1998, 2♂, 1♀, leg. Vujić A, Sušičko jezero-Sastavci CN38, 31.v–2.vi.1998, 1♂, leg. Milenković, 20.vi.1998, 1♂, leg. Vujić A, Sušica-Skakala CN38, 25-26.vi.1997, 2♂, leg. Vujić A, Škrčka jezero CN37, viii.1997, 1♂, leg. Vujić A, (IBNS).

***Cheilosia ortotricha* Vujić et Claussen, 1994**
Verified data: Vujić & Claussen, 1994, Vujić, 1996

Examined material (Map 3)
Published records: Vujić & Claussen, 1994: Croatia: Zagreb, Sljeme WL79,

30.v.1897, 1♂, leg. Langhoffer (CNHM), Papuk YL14, 15.iv.1991, 1♂, 1♀, leg. Vujić A; **Bosnia Herzegovina:** Konjuh, CQ00, 10.iv.1989, 5♂, 2♀, leg. Vujić A, Zelengora CP00, 11.iv.1989, 2♂, leg. Vujić A; Maglić, Perućica CN19, 11.iv.1989, 4♂, leg. Vujić A; Volujak, Trnovačko jezero CN19, 11.iv.1989, 8♂, 1♀, leg. Vujić A, 15.v.1989, 5♀, leg. Vujić A; Jahorina CP04, 14.v.1989, 8♂, 5♀, leg. Vujić A, 26.vi.1989, 1♀, leg Vujić A, 14.vi.1991, 2♂, 3♀, leg Vujić A (3f det. Vujić as *Cheilosia canicularis*), (IBNS); Sarajevo, Stambulčić CP05, v.1916, 1♂, leg. Apfelbeck (BHMS); **Montenegro:** Bjelasica, Biogradsko jezero CN85, 28.iv.1990, 2♂, 1♀, leg. Radnović D, Vujić A, 5.v.1990, 1♂, leg. Radović D; **Serbia:** Fruška Gora, Paragovo DR00, 26.iii.1988, 3♂, leg. Milankov V, Radnović D, Vujić A, Glavica DR00, 5.iv.1989, 1♀, leg. Vujić A, Stari Ledinci DR00,



Map. 3. Distribution of *Cheilosia orthotricha* on the Balkan Peninsula

25.ii.1990, 2♂, 1♀, leg. Vujić A; Deli Jovan EP99, 27.iii.1989, 1♂, leg. Vujić A; Kukavica, Vučjanka EN74, 30.iii.1989, 5♀, leg. Ranđelović B, Vujić A; Bosilegrad, Izvor FN20, 31.iii.1989, 1♀, leg. Vujić A; Kopaonik, Samokovska reka DP70 DN89, 1.v.1986, 1♀, leg. Vujić A, 2.v.1991, 1♂, 4♀, leg. Radnović D, Stolić S, Vujić A, Graševačka reka DN99, 26.iv.1987, 2♂, leg. Ercegovac, Vujić A, 24.v.1987, 2♂, leg. Vujić A, Jošanička banja DP70, 29.iv.1987, 1♀, leg. Vujić A, Rasina DP91, 29.iv.1987, 1♂, leg. Vujić A, Srebrenac DN89, 2.v.1991, 4♂, leg. Radnović D, Stolić S, Vujić A; Čemernik, Crna reka FN04, 11.iv.1988, 1♂, leg. Vujić A, 3.v.1988, 2♂, 1♀, leg. Radnović D, Vujić A, Vrla FN02, 4.v.1988. 1♂, 1♀, leg. Radnović D, Vujić A; Stara Planina, Dojkinačka reka FN49, 29.v.1987, 1♀, leg.Vujić A, 6.v.1988, 3♂, leg. Radnović D, Vujić A, Temska FN29, 7.v.1988, 1♂, leg. Vujić A; Debeli Lug, Felješana EQ71, 2.v.1993, 4♀, leg. Radnović D, Vujić A, Klisura Peka EQ71, 3.v.1993, 1♂, leg. Vujić A (IBNS); **Vujić, 1996: Bosnia Herzegovina:** Jahorina, Sredina CP04, 14.vi.1991, 3♀, leg. Vujić A; **Serbia:** Fruška Gora, Glavica DR00, 13. iv 1994, 1♀, leg. Radenković S, Vujić A; Kučaj, Demizlok EP77, 1.iv.1994, 2♂, leg. Vujić A (IBNS).
New records: Montenegro: Durmitor: Sušičko jezero–Surdup CN38, 16-17.v.2001, 1♂, leg. Vujić A, Kanjon Sušice CN38, 16.iv.2000, 1♀, leg. Vujić A; **Serbia:** Kopaonik, Brzeće-Radmanovo, 30.iv.2001, 1♂, Radišić P, Fruška Gora, Paragovo DN00, 15.ii.2001, 1♂, leg. Šikoparija B; Vojvodina, Sefkerin–Opovo DQ85, 23.iv.2000, 1♂, 1♀, leg. Radišić P (IBNS).

TAXONOMY

The morphology of the arista, distiphalus sclerite, and female third and fourth abdominal tergites provided the most important diagnostic features for *C. canicularis* and *C. himantopus*. Other characters (surstilus and hypandrum morphology, color of tarsi and wideness of female frons) used in the key by STUKE & CLAUSSEN (2000) showed intraspecific variability.

Within examined specimens, females of *C. himantopus* collected in the Balkan Peninsula lack black hairs on mesonotum, while females of *C. canicularis* have intermixed black and yellow hairs on the mesonotum. The specimens from alpine region are an exeption. They are darker in general, and females of both species have a few dark hairs on the mesonotum.

Scanning electron microscope examination revealed folds and grooves on the arista surface at the base of arista hairs in both *C. canicularis* and *C. himantopus*, whereas the arista surface of *C. ortotricha* is smooth (Fig. 1.). Towards the apex of the arista, these folds and grooves and associated arista hairs diminish in number and are absent at the extreme apex of the arista. *C. canicularis* has dense and well-built folds and grooves (Fig. 2.) while those of *C. himantopus* are less pronounced (Fig. 3.). If the length of arista hairs cannot be estimated, arista surface

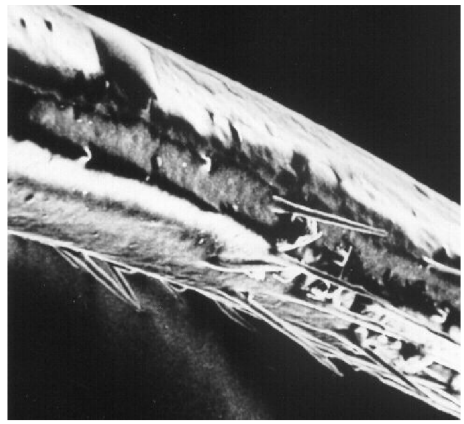


Fig. 1. SEM photos of the basal part of arista of *Cheilosia orthotricha* (male).

may be used to distinguish *C. canicularis* from *C. himantopus*. In this study, four morphological intermediate specimens could be confidently determined to species only by using the structure of arista surface.

BIOLOGY

In early spring, females of *C. ortotricha* were observed ovopositing at the base of scale leaves on the scape of *Petasites hybridus,* although larvae of *C. ortotricha* were not found during this study.

Females of *C. himantopus* were observed ovipositing on the leaf bud of *Petasites hybridus* in late spring. Eggs were laid on structures such as dead leaves, twigs and non-host plants near *Petasites hybridus* with undeveloped leaf buds. We

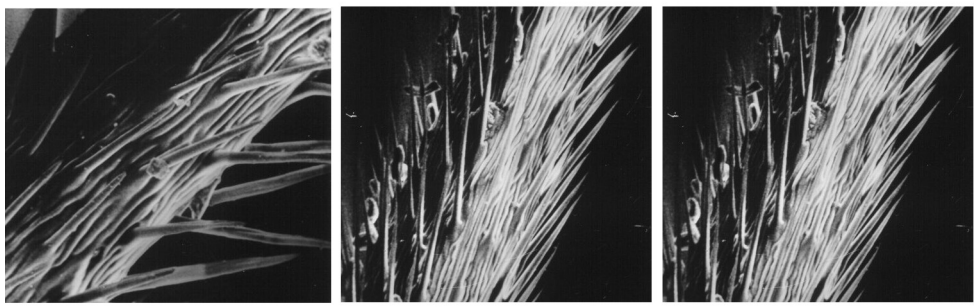


Fig. 2. SEM photos of the basal part of arista of *Cheilosia canicularis*. (a) Kopaonik mountain, male; (b) Durmitor mountain, male; (c) Durmitor mountain, female.

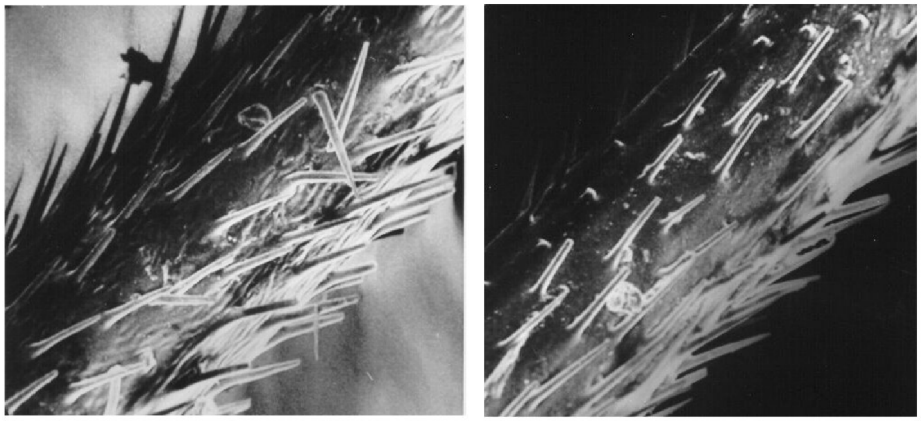


Fig. 3. SEM photos of the basal part of arista of *Cheilosia himantopus*. (a) Durmitor mountain, male; (b) Durmitor mountain, female.

did not find out whether larvae hatching from these eggs die or are able to survive by moving to *Petasites hybridus* leaf buds. Leaf buds of *Petasites hybridus* are either entirely consumed by *C. himantopus* larvae or abandoned when the temperature drops in the fall. If the temperature rises again for a short period and the leaves have not wilted, larvae move from the rhizome back to leaf bud and feed until the temperature drops. After the leaves are unsuitable, the larvae move to the rhizome, which provides living plant tissue and an ideal place for the larvae to overwinter. Pupation starts in spring, after the larvae overwinter. The anterior end of *C. himantopus* pupae protrude from part of the rhizome, which emerges from ground. It is interesting to note that larvae of *C. himantopus* in wilted leaves were able to develop in the laboratory if transfered to flower buds of *P. hybridus*.

Females of *C. canicularis* were observed ovipositing on leaves of *P. hybridus* surrounding flower buds or on leaf buds in late summer and early autumn. Larvae feed on these structures until the temperature drops or until the plant tissue is unsuitable. Overwintering occurs in the rhizome from which the larvae emerge or pupate in late summer the following year. Pupae were found in the rhizome but most often in ground near *P. hybridus*. All larvae that were brought in laboratory destroyed the rhizome after a long period of development and then pupated in ground. This often happens in nature.

The most substantial growth for larvae of both species occured outside the rhizome in the soft, nutritive tissue of leaf bud or flower bud. This was due to fact that rhizome tissue is firm and probably more difficult for the larvae to eat.

CONCLUSION

It was found that females of *C. himantopus* lack black hairs on mesonotum, while females of *C. canicularis* have black and yellow hairs intermixed. Specimens from alpine region are exception.

If length of arista hairs cannot be examind, arista surface could be important character according to which we could distinguish *C. canicularis* from *C. himantopus*.

The observations that *C. canicularis* and *C. himantopus* feed on healthy plant tissue and that *C. canicularis* sometimes pupate in *Petasites hybridus* rhizome contradict previous findings (STUKE & CLAUSSEN, 2000). This study confirms that eggs of *C. canicularis* can be found on *Petasites hybridus* leaf buds in autumn and that larvae from those eggs can survive winter (DUŠEK, 1962).

The similarities in the biology of *C. himantopus* and *C. canicularis* lead to the conclusion that they were spring and summer generations of one species. Further molecular studies should provide information, how far the separation process of those two taxa reached.

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