

**THE NATIONAL PARK KALKALPEN AS A REFUGE AREA
FOR RARE SPECIES: *SIMULIUM (OBUCHOVIA) AURICOMA*
AND *SIMULIUM (SIMULIUM) DEGRANGEI*
– RECORDED FOR THE FIRST TIME IN UPPER AUSTRIA**

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Abstract: Investigations dealing with the blackfly fauna of the National Park Kalkalpen in Upper Austria have been carried out since August 2000. As a result of continuing research three additional species can be appended to the previously published taxa list, finally comprising 27 of the 45 Austrian blackfly species (i. e. 60% of the country's total number of species). In addition to its remarkable species richness, the area offers habitat to a wide range of particularly rare blackfly species, among them *Simulium (Obuchovia) auricoma* Meigen, 1818 and *Simulium (Simulium) degrangei* Grenier et Drier, 1960, that were recorded for the first time in Upper Austria.

Keywords: blackflies, Simuliidae, rare species, National Park Kalkalpen, Austria

INTRODUCTION

Creating a preferably complete list of blackfly species occurring in the National Park Kalkalpen was the aim of a survey that was being carried out in August and September 2000. In order to round out the taxa list, examinations have been continued at irregular intervals throughout the past two years.

The investigation area – the National Park Kalkalpen – is one out of four internationally accepted National Parks in Austria, measuring up to the standards of the IUCN. Its area of 18,800 hectares covers two large mountain ranges, the Sengsengebirge and the Reichraminger Hintergebirge, both of which are limestone massifs (Fig. 1). The climate can be described as relatively moist (average precipitation equals 2000 mm a⁻¹), altitudes above 1000 metres a. s. l. are permanently covered with snow from November to April (BOGNER et al. 2002). 103 different types of biotopes have been proven in the mountainous area so far, making the National Park a region with a biotope diversity unparalleled in the Northern Limestone Alps (LENLACHER 2000). This is reflected in a vast species richness that has been documented in several fields: 800 fern and angiosperm species have been proven in the Reichraminger Hintergebirge up to now (LENLACHER 2000), a particular species richness in macrolepidoptera is cited (HAUSER 1995, WIMMER et al. 1991), not to mention the great number of makrozoobenthos taxa (WEIGAND et al. 1998, SCHEDER 2001). The high biodiversity in the National Park originates from heterogeneous temperature distributions in

Presented at 12. Deutschsprachiges/ 4. Europäisches Simuliidensymposium, Bratislava, 11.-13.10.2002.

combination with a wide range of altitudinal belts: The lowermost spot in the lowland areas is located at 385 m above sea level, whereas the Hohe Nock – highest mountain within the region – reaches an elevation of 1963 m.

MATERIAL AND METHODS

At the sampling sites general characteristics (vegetation, light exposure, sediment type) were mapped, current velocity at 40% depth was measured using an impeller-meter (Ott C2, diameter 30 mm).

Preimaginal stages of blackflies (larvae and pupae) were collected from stones, submersed vegetation and twigs, and immediately transferred into PE-tubes filled with 70% ethanol. Species were determined using a stereomicroscope (NIKON SMZ-10), last instar larvae were put into 50% acetic acid that forced the pupal gill histoblasts to unroll. For determination at species level the key by SEITZ (1998) was used.

RESULTS AND DISCUSSION

In September 2000, 24 of the 45 Austrian blackfly species were proven within the National Park area (SCHEDER 2001). Collections in May 2001 revealed the occurrence of three more species, two of which are considered to be extraordinarily rare: *Simulium (Obuchovia)*

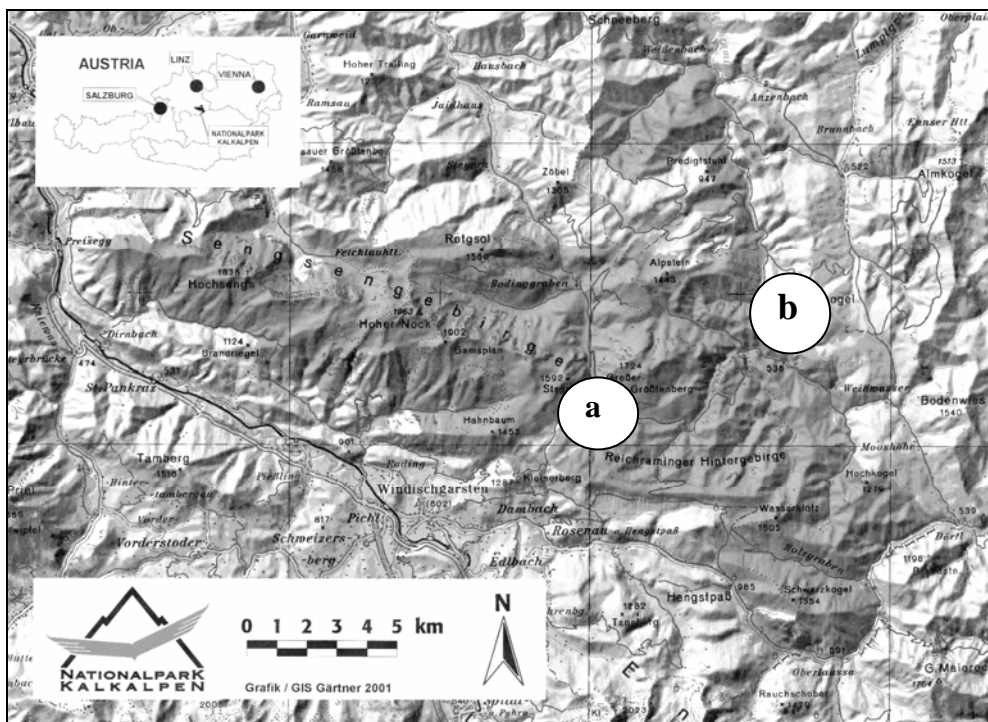


Fig. 1. Situation of the National Park Kalkalpen, Upper Austria, Austria. White spots mark the locations of occurrence of a) *Simulium (Obuchovia) auricoma* and b) *Simulium (Simulium) degrangei*.

Tab. 1. List of confirmed blackfly species in the National Park Kalkalpen (compiled from TOCKNER 1990, FESL 1994, SCHEDER 2001 and the present report; nomenclature according to CROSSKEY 1987).

Genus <i>Prosimulium</i> Roubaud, 1906	<i>S. (N.) latigonium</i> (Rubzov, 1959)
<i>P. hirtipes</i> (Fries, 1824)	<i>S. (N.) quasidocolletum</i> Crosskey 1988
<i>P. latimucro</i> (Enderlein, 1925)	<i>S. (N.) vernum</i> Macquart, 1826
<i>P. rufipes</i> (Meigen, 1830)	Subgenus <i>Obuchovia</i> Rubzov, 1947
<i>P. tomosvaryi</i> (Enderlein, 1921)	<i>S. (O.) auricoma</i> Meigen, 1818
Genus <i>Simulium</i> Latreille, 1802	Subgenus <i>Simulium</i> s. str.
Subgenus <i>Boophthora</i> Enderlein, 1925	<i>S. (S.) argenteostriatum</i> Strobl, 1898
<i>S. (B.) erythrocephalum</i> (De Geer, 1776)	<i>S. (S.) argyreatum</i> Meigen, 1838
Subgenus <i>Nevermannia</i> Enderlein, 1921	<i>S. (S.) degrangei</i> Dorier et Grenier, 1960
<i>S. (N.) angustitarse</i> (Lundström, 1911)	<i>S. (S.) intermedium</i> Roubaud, 1906
<i>S. (N.) bertrandi</i> Grenier et Dorier, 1959	<i>S. (S.) maximum</i> (Knoz, 1961)
<i>S. (N.) brevidens</i> (Rubzov, 1956)	<i>S. (S.) monticola</i> Friedrichs, 1920
<i>S. (N.) carpathicum</i> (Knoz, 1961)	<i>S. (S.) ornatum</i> Meigen, 1818
<i>S. (N.) carthusiense</i> Grenier & Dorier, 1959	<i>S. (S.) reptans</i> (Linnaeus, 1758)
<i>S. (N.) costatum</i> Friedrichs, 1920	<i>S. (S.) trifasciatum</i> Curtis, 1839
<i>S. (N.) crenobium</i> (Knoz, 1961)	<i>S. (S.) variegatum</i> Meigen, 1818
<i>S. (N.) cryophilum</i> (Rubzov, 1959)	

auricoma Meigen, 1818 and *Simulium (Simulium) degrangei* Dorier & Grenier, 1960; *Simulium (Simulium) ornatum* Meigen, 1818, on the other hand, is a very widespread species that can be found all over Austria, but had not occurred in the investigation area so far. Altogether, the National Park offers habitat to 27 species, split up into 2 genera and 5 subgenera (Tab. 1).

S. (O.) auricoma can be characterized as one of the rarest blackfly species in Austria. It was included in the Austrian blackfly checklist because of one single record in a small brook near Göstling in the West of Lower Austria, on September 13, 1975 (CAR 1981). Since that date, no further findings have been recorded.

On May 25, 2001, the author happened to encounter evidence that this rare species is an integral part of the blackfly fauna of Upper Austria. The location of occurrence was situated in the center of the National Park, in an outstandingly dynamic third-order mountain brook named Rumpelmayrbach, at 1020 metres above sea level (Fig. 1, a). Its catchment area is extremely isolated, hence not affected by any anthropogenic interference. Banks are rather densely forested with alders (*Alnus incana*), beeches (*Fagus sylvatica*) and firs (*Abies alba*), despite which missing crown canopy enables photosynthesis within the watercourse over long distances. Hydraulic and chemical conditions are characterized by high current (160 cm s⁻¹ at 40% depth), permanent oxygen saturation and low water temperature all over the year – during summer, temperatures hardly ever exceed 10 °C (WEIGAND, in litt.). The bottom of the brook is covered mostly with slabs, rocks and cobbles; sandy substrates are extremely rare and restricted to sections with lesser current velocity. In consequence of the geological situation cascades, riffles and pools alternate frequently (Fig. 2), and additionally, slowly-running anabranches with scarce submerse vegetation can be found in the surrounding area. Due to several intermittent sections the watercourse often does not correspond directly with close-by brooks, thus offering habitat to a well-defined special zoocoenosis. In spite of its low degree of investigation, several noteworthy findings



Fig. 2. High current velocities and frequently alternating riffles, pools and cascades characterize the Rumpelmayrbach, where *S. (O.) auricoma* was proven for the first time in Upper Austria.



Fig. 3. The section of this fifth-order brook called Großer Bach, where *S. (S.) degrangei* was collected, represents the metarhithral region within the river continuum.

such as the occurrence of an autochthonous, genetically distinguishable form of the brown trout (*Salmo trutta* forma *fario* L.) have already been published (HAUNSCHMID 2000, WEISS et al. 2000, WEIGAND 2001).

In spring 2001, *S. (O.) auricoma* was the predominant species at the site, with pupae and larvae covering rocks and cobbles in high abundances. Several accessory species have been found at the location since the beginning of the taxonomical investigations in August 2000, most important of which is *Simulium (Simulium) maximum* (Knoz, 1961), being another specifically rare species in Austria. *Simulium (Simulium) variegatum* Meigen, 1818 and *S. (S.) monticola* Friedrichs, 1920 complete the checklist of this brook. All those species are generally found in oligosaprobic running waters, thus indicating high water quality; with regard to the isolated situation of the catchment area and missing anthropogenic influence, occurrence of this pure water association accords to expectations.

S. (O.) auricoma appears in several countries in Central and Southern Europe: Detailed records have been published for Germany (BRAUKMANN 1987, FRIEDRICHS 1920, GRUNEWALD 1965, SCHNEIDER 1987, SEITZ 1992, ZWICK 1974), former Czechoslovakia (KNOZ 1965, JEDLIČKA 1976) and France (VINÇON & CLERGUE-GAZEAU 1988); BELQUAT

(2000) also mentions occurrences in Italy, Spain, Portugal, former Yugoslavia, Bulgaria, Greece, Cyprus, Morocco and Lebanon. Almost all authors describe the locations of occurrence as cold mountain brooks with extremely turbulent flow regimes. Obviously this species is able to minimize predation pressure by settling on smooth stone surfaces exposed to current velocities too high for a prevalence of predating species (SEITZ 1992).

The rareness of *S. (O.) auricoma* makes it difficult for dipterologists to finally reveal its saprobial and ecological preferences. The present record seems to verify that it is mainly to be found in highly elevated, cold and pure mountain brooks without anthropogenic disturbance, as is described in most publications. SEITZ (1992), in contrast, mentions five records of this species in Niederbayern (Southern Germany), all sited between 300 and 460 m above sea level, in relatively turbid streams of higher order, affected rather heavily by human activity. The inconsistency of these records with other publications is possibly due to a higher adaptability of the species in its ecological requirements than was supposed thus far.

S. (S.) degrangei, the second newly found species in the area, was proven at several locations in the National Park in spring 2001. The site with the highest abundances was situated in a fifth-order tributary of the Enns, a mountain brook called Großer Bach, which is one of the two largest and most important watercourses in the region (Fig. 1, b). Its catchment area measures 168,6 km² and covers a whole mountain range (the Reichraminger Hintergebirge). Mean water temperatures range from 3 °C in winter to 15 °C in summer, current velocity at 40% depth does not exceed 50 cm s⁻¹ under low water conditions. Banks are forested sparsely, the relatively large water body is therefore almost entirely exposed to sunlight (Fig. 3). Specimens (mainly pupae and last instar larvae) were collected at a site located at 473 m above sea level on May 29, 2001. *S. (S.) variegatum* and *Simulium (Simulium) argenteostriatum* STROBL, 1898 are frequently found at that location, but decrease significantly in number in the presence of *S. (S.) degrangei*.

The author also collected pupae of *S. (S.) degrangei* in the second fifth-order watercourse in the National Park region, a brook called Krumme Steyrling. The site is situated at 677 m above sea level and resembles the brook mentioned above in most respects.

S. (S.) degrangei is found all over Western and Central Europe – KNOZ (1965) mentions records in France, Italy, former Yugoslavia and former Czechoslovakia – nevertheless characterised as outstandingly rare: BULÁNKOVÁ et al. (2001) describe it as “a rare Diptera species important not only from regional but also European aspect”, HALGOŠ (1970) also confirms its special status within the simuliids. Its rareness is due to its scattered distribution: Specimens can be found at very few locations only, but once they occur, they tend to supersede other blackfly species. According to MOOG (1995), *S. (S.) degrangei* evidently prefers sections with oligosaprobic characteristics, yet it may sporadically be found in xenosaprobic as well as α -mesosaprobic running waters. Though it is occasionally found in the epirhithral, it occurs mostly in the meta- and hyporhithral. These ecological features can be confirmed by the present observations.

For the sake of completeness, the first record of *Simulium (Simulium) ornatum* MEIGEN, 1818 in the National Park area shall be stated at this point. In contrast to the species mentioned above, this representative of the blackfly family is one of the most common in Europe. It is distributed all over the Palaearctic region, occurring in almost all types of flowing water (KNOZ 1965), inasmuch as the water is reasonably polluted. Since most of the water courses in the National Park are not affected by human activity, this species had not

been found in the region before recently, as outlets of fishponds in the surrounding area were observed (contrary to expectations, the coenosis consisted of *S. (S.) ornatum* unexceptionally, the predicted occurrence of *S. (S.) noelleri* could not be proven).

ACKNOWLEDGEMENTS

I wish to express gratitude to Dr. Erich WEIGAND, research coordinator of the National Park Kalkalpen, who always supported me in my work, provided countless information and finally made it possible for me to carry out determinations at the National Park Centre laboratories in Molln, Upper Austria. Furthermore I want to thank Patrick FUCHS for attending me during my samplings. Finally and in particular I am indebted to my beloved boyfriend, Markus PICHLER, who not only reviewed my English manuscript, but also keeps on appreciating my work and encouraging me to continue. Thank you!

REFERENCES

- BELQUAT, B., 2000: Découverte de *Simulium* (*Obuchovia*) *galloprovinciale* et *Simulium* (*Obuchovia*) *auricoma*: deux nouvelles espèces pour le Nord de l'Afrique. *The British Simuliid Group Bulletin*, **15**: 15-17.
- BOGNER, M., LEHNER, T. & MAHRINGER, G., 2002: Das meteorologische Messnetz im Nationalpark Kalkalpen, Oberösterreich. Flächendeckende Erfassung und Auswertung von Niederschlag, Temperatur und Strahlung. *Revue de Géographie Alpine*, **2**: 61-72.
- BRAUKMANN, U., 1987: Zooökologische und saprobiologische Beiträge zu einer allgemeinen regionalen Bachtypologie. *Arch. Hydrobiol. Beih. Ergebn. Limnol.*, **26**: 1-355.
- BULÁNKOVÁ, E., HALGOŠ, J. & ILLÉŠOVÁ, D., 2001: Changes of Diptera taxocoenoses in the longitudinal profile of the Gidra stream basin (the Little Carpathians). *Acta Universitatis Carolinae, Biologica*, **45**: 19-24.
- CAR, M., 1981: Die Simuliidenfauna Österreichs und ihre veterinärmedizinische Bedeutung. *Veterinärmedizinische Dissertation, Wien*.
- CROSSKEY, R. W., 1987: An Annotated Checklist of the World Black Flies (Diptera: Simuliidae). In: KIM, K. C. & R. W. MERRITT (ed.): Black flies. pp. 425-520, (*The Pennsylvania State University Park & London*).
- FESL, C., 1994: Quantitative Erfassung des Makrozoobenthos und der Umweltparameter eines Karstfließgewässers mit stark fluktuierendem hydrologischen Regime unter besonderer Berücksichtigung der Simuliidae (Diptera). *Diplomarbeit am Institut für Zoologie der Universität Wien*
- FRIEDRICHS, K., 1920: Zur Kenntnis der deutschen Simuliiden. *Sber. Abh. Naturforsch. Ges. Rostock, NF*, **7** (2): 1-16.
- GRUNEWALD, J., 1965: Zur Kenntnis der Simuliidenfauna (Diptera) des Süd-Schwarzwaldes und seiner Randgebiete. *Beitr. Naturk. Forsch. SW-Deutschl.*, **24**: 143-152.
- HALGOŠ, J., 1970: Neue Funde von *Simulium* (*Cleitosimulium*) *degrangei* DORIER et GRENIER 1959 (Diptera, Simuliidae) in der Slowakei. *Acta rer. natur. Mus. nat. Slov., Bratislava*, **16**: 199-200.
- HAUNSCHMID, R., 2000: Fischbestandserhebung in den Fließgewässern des Nationalparks Kalkalpen. In: Forschung im Nationalpark 2000. *Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft. Sonderband Umwelt*, pp. 38-41.
- HAUSER E., 1995: Die Großschmetterlingsfauna des Sengsengebirges mit besonderer Berücksichtigung der nachtaktiven Arten (oberösterreichische Kalkalpen). *Beitr. Naturk. Oberösterreichs*, **3**: 239-284.

- JEDLIČKA, L., 1976: Blackflies (Diptera, Simuliidae) spread in Middle Slovakia. *Acta F. R. N. Univ. Comen. – Zoologia*, **20**: 97-127.
- KNOZ, J., 1965: To identification of Czechoslovakian Black-Flies (Diptera Simuliidae). *Folia Fac. scient. nat. Univ. Purkyn. Brunensis*, **6** (5): 1-97.
- LENGLACHER, F., 2000: Biotopkartierung Nationalpark Kalkalpen. In: *Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft, Forschung im Nationalpark 2000, Reihe Umwelt*, pp. 29-31.
- MOOG, O., 1995: Fauna Aquatica Austriaca. *Wasserwirtschaftskataster, Bundesministerium für Land- und Forstwirtschaft, Wien*.
- SCHEDER, C., 2001: Zur Erhebung der Simuliidenfauna im Nationalpark „Oberösterreichische Kalkalpen“ (Österreich). *Studia dipterologica*, **8**: 607-612.
- SCHNEIDER, E., 1987: Die Dipterenfauna beim Rind im Raum Passau (Simuliidae und Tabanidae). *Veterinärmedizinische Dissertation, München*.
- SEITZ, G., 1992: Verbreitung und Ökologie der Kriebelmücken (Diptera: Simuliidae) in Niederbayern. *Lauterbornia*, **11**: 1-230.
- SEITZ, G., 1998: Bestimmungsschlüssel für die Präimaginalstadien der Kriebelmücken Deutschlands (Stand: 01.11.1998). In: *Bayerisches Landesamt für Wasserwirtschaft: Dienstbesprechung Biologisch-ökologische Gewässeruntersuchung 1998*, Materialien Nr. 77 (November 1998): 140-154, München.
- TOCKNER, K., 1990: Forschungsbericht 1990. *Eigenverlag Nationalpark Kalkalpen, Kirchdorf*.
- VINÇON, G. & CLERGUE-GAZEAU, M., 1988: Etude hydrobiologique de la vallée d'Ossau (Pyrénées-Atlantiques, France), III. Simuliidae (Diptera, Nematocera): leur originalité biogéographique et écologique. *Annls Limnol.*, **24**: 67-81.
- WEIGAND, E., 2001: Förderprogramm für Fische. *National Geographic*, Sept. 2001: p. 11.
- WEIGAND, E., BAUERNFEIND, E., GRAF, W. & PANZENBÖCK, M., 1998: Limnologische Untersuchungen von Karstquellen und Höhlengewässern im Nationalpark Kalkalpen. *Unveröff. Bericht des Vereins Nationalpark Kalkalpen*, 1-116.
- WEISS, S., LINHARES, D. & HAUNSMID, R., 2000: Vorläufige Untersuchungen der genetischen Diversität der Bachforelle (*Salmo trutta* L.) im Nationalpark Kalkalpen. *Unveröff. Studie i. A. der Nationalpark O.ö. Kalkalpen GesmbH*. pp. 1-7.
- WIMMER, J., FÜRLINGER, H., HOFFMANN, F. & MÜLLNER, K., 1991: II. Beitrag zur Kenntnis der Macrolepidopterenfauna des Reichraminger Hintergebirges in Oberösterreich. *Beiträge zur Kenntnis der Insektenfauna von Oberösterreich*, **25**: 1-41.
- ZWICK, H., 1974: Faunistisch-ökologische und taxonomische Untersuchungen an Simuliidae (Diptera) unter besonderer Berücksichtigung der Arten des Fulda-Gebietes. *Abh. senckenb. naturf. Ges.*, **533**: 1-116.

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Zeitschrift/Journal: [Nationalpark Kalkalpen - diverse Schriften](#)

Jahr/Year: 2004

Band/Volume: [18_2004](#)

Autor(en)/Author(s): Scheder Christian

Artikel/Article: [THE NATIONAL PARK KALKALPEN AS A REFUGE AREA FOR RARE SPECIES: SIMULIUM \(OBUCHOVIA\) AURICOMA AND SIMULIUM \(SIMULIUM\) DEGRANGEI – RECORDED FOR THE FIRST TIME IN UPPER AUSTRIA 31-37](#)