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Review of the *Dichotrachelus alpestris* STIERLIN, 1878 species group with evidence for a species complex of *D. augusti* F. SOLARI, 1946, and *D. sondereggeri* sp. nov. from Switzerland (Coleoptera, Curculionidae)

Christoph Germann

ABSTRACT

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The three species belonging to the *Dichotrachelus alpestris* species group are reviewed. Thereby the lectotype of *D. walteri* BARAJON, 1947 is designated, and its name is proposed as syn. nov. of *D. alpestris* STIERLIN, 1878. Three deviating forms of the aedeagus of *D. augusti* F. SOLARI, 1946 are presented, which indicate a species complex. More specimens of this rarely collected species are needed to clarify this circumstance. *D. sondereggeri* sp. nov. from Valposchiavo in the Swiss canton of Grisons represents the easternmost finding of the species group. The new species is described and illustrated, and details on its biology are reported. An overview of the distribution, and a key to all species of the group are provided.

Keywords: Cyclominae, new synonymy, lectotype designation, new species, taxonomy, Grisons, Switzerland.

Introduction

The genus *Dichotrachelus* STIERLIN, 1853 actually comprises 74 valid taxa (60 species and 14 subspecies) (Meregalli 1989, Osella & Meregalli 2007, Germann 2009, Germann & Baur 2010, Meregalli 2011) distributed from the Carpathian Alps, Alps of Slovenia, Austria, Switzerland, Italy including Sicily and Sardinia, France including Corsica, Spain, down to southern Portugal and North Africa (Morocco and Algeria). In Switzerland, the genus *Dichotrachelus* is represented by 11 species and subspecies (Germann 2010, 2011). The present new species is included (as *Dichotrachelus* sp. 1), whereas one additional species (hereafter reported on as form III of *D. augusti*) is not yet described, and another subspecies is considered as doubtful (*muscorum tournieri* STIERLIN, 1878).

Species of *Dichotrachelus* are typically alpine at high altitudes (montane to alpine zone) and are restricted to often very small areas. As far as details of their larval development are known, *Dichotrachelus* are muscicolous (Germann 2004, Germann & Baur 2010), they develop in compact moss cushions (Bryophyta) as e.g. *Bryum*, *Ceratodon*, *Dicranoweisia*, *Distichium*, *Grimmia*, *Polytrichum*, *Oligotrichum*, *Racomitrium*, *Schistidium*, *Tortella* and *Tortula*. Other possible host plants such as Saxifragaceae (*Saxifraga* spp.), Crassulaceae (*Sempervivum* sp.) and Caryophyllaceae (*Alsine* sp.) were compiled by Meregalli (1980) and very recently re-mentioned by Osella & Meregalli (2007), where larvae of *D. kahleni* OSELLA & MEREGALLI, 2007 were found in *Saxifraga caesia* L. clumps. However, given that successful breeding of larvae is only documented in mosses at this time, other host plant indications should be treated with caution.

Since the description of the genus most of the recent knowledge was established with the revisions by Osella (1967, Italian species; 1970, entire genus) and Meregalli (1987, Spanish species). Actually, the history of intensive research in this genus is remarkably young as more than half of the taxa (41) were described only after 1946, mainly by Barajon (1946, 1947), González (1964), Osella (e.g. 1967, 1970), and Meregalli (e.g. 1982, 1987). However, the status of some of the species is still unclear as has been recently stated and presented by Germann (2009) and Germann & Baur (2010). During revisionary work (Osella, Meregalli op. cit.) about 11 species groups were specified, based on similarities of the species' morphology. A thorough phylogenetic analysis, ideally including molecular data, is still missing. One of these species groups defined by Osella (1970) is the *alpestris* species group consisting of the three species *alpestris* STIERLIN, 1878, *walteri* BARAJON, 1947 and *augusti* F. SOLARI, 1946.

With the present contribution I focus on the *D. alpestris* species group with a lectotype designation, a new synonymy, and indicating the presence of a species complex around *D. augusti*. Furthermore, *D. sondereggeri* sp. nov. is described as a new member of this group. The new species has been originally discovered during revisionary work in the collection of the Muséum d'histoire naturelle de Genève, and had already been announced by Germann (2009) with doubts, as only a single female specimen, not attributable to any described species was known. A successful recent excursion into the area of the first finding by Claude Besuchet in 1994 revealed six further specimens and therefore allowed the present description.

Material and Methods

The male and female genital structures were extracted and either dry glued on the labels or stored in a glycerine containing glass vial, pinned under the dry mounted specimen, except one specimen which was conserved in 90% ethanol. The genital structures were photographed partly beneath glycerine (female structures) and partly dried (male structures) with a 5-megapixel digital camera (Leica DFC425) under a stereomicroscope (Leica MZ16). The same camera was used for depicting the body. The images were processed by an Auto-Montage software (Imagic Image Access, Version 10) and then reworked using Adobe Photoshop version 10.0.1 (Adobe Systems Incorporated). The body size was measured dorsally from the apex of the elytra to the front margin of the eyes. The length of the rostrum was measured dorsally from the labrum to the front margin of the eyes, its breadth at the broadest point just before the eyes.

Label data of type material are reported literally, labels are separated by double slash (/), and my own remarks are added in rectangular brackets.

Abbreviations used:

cAS	collection of Alexander Szallies (Reutlingen)
cCG	collection of Christoph Germann (Thun)
cMB	collection of Mario Barajon (Milano)
cVR	collection of Vittorio Rosa (Milano)
cWS	collection of Wolfgang Schiller (Grenzach-Wyhlen)
ETHZ	Eidgenössische Technische Hochschule Zürich
MHNG	Muséum d'histoire naturelle de Genève
NMBA	Naturhistorisches Museum Basel
NMBE	Naturhistorisches Museum der Burgergemeinde Bern
NMLU	Natur-Museum Luzern

Taxonomic part

Dichotrachelus alpestris species group

Characterization (modified after Osella 1970): small species (3.2–4.9 mm); 3rd tarsal segment narrow, about as wide as previous segments; pronotum elongate and cylindrical; rostrum slender, straight to slightly bowed; aedeagus with subtruncated apex; distributed from the Western Alps (France, Vercors) eastwards to the southern Bernina massif (Switzerland).

Type material examined: *D. walteri*: 4 specimens (cMB). A ♂ lectotype and 3 paralectotypes were selected and are designated here in agreement with Recommendation 73F of the ICZN (2000). Label data: 1 ♂: PIEM. – 1946 G. Paradiso C. Arietta 15-7 Barajon // *walteri* [handwritten] // [Red label] Lectotype *Dichotrachelus walteri* BARAJON, 1947 des. C. Germann 2011 (= syn. nov. *D. alpestris* Stierlin, 1878). 1 ♂, 2 ♀: first label contains the same indications // *D. walteri* mihi (handwritten) // [Red label] Paralectotype *Dichotrachelus walteri* BARAJON, 1947 des. C. Germann 2011 (= syn. nov. *D. alpestris* STIERLIN, 1878). Remark: the apex of the aedeagus of the ♂ paralectotype is damaged.

Proposed synonymy

Barajon (1947: 32) described *D. walteri* based on "...quattro esemplari (2 ♂ e 2 ♀) di una nuova specie..." "...catturato il 15-7-1946..." from Colle Arietta (Gran Paradiso massif). However, already Osella (1970) reported in his revision only minute morphological differences with respect to *D. alpestris*. These differences are summarized: Elytral vestiture consisting only of dark brownish scales; Striae less pronounced, third interval diverging towards the elytral decline, its width more than twice the size at base; Elytra more oval shaped and gracile; Pronotum laterally more strongly rounded; Eyes slightly bigger and protruding; Rostrum longer and less curved; Scape of the antennae regularly enlarged, longer than *D. alpestris*. An examination of the type series (cMB), and the examination of further material (cVR), and their comparison with 133 specimens of *D. alpestris* (Appendix 1) showed that these differences – including furthermore the shape of the aedeagus (Figs 11–16, 20) – fall into the variability observed in *D. alpestris*. Therefore I propose the following synonymy: *Dichotrachelus alpestris* STIERLIN, 1878 = *walteri* BARAJON, 1947 **syn. nov.**

Remarks on *Dichotrachelus augusti*

The holotype of *D. augusti* with the following indications by Solari (1946: 10–11): "Patria: Piemonte (Champoluc in Valle Aosta); holotypus ♀." and "Un solo esemplare, raccolto da mio figlio Augusto in Val di Cuneo, il 15.VII.1935, nel muschio cresciuto su di una roccia." was not examined. In return a total of 19 specimens of *D. augusti* from various localities were examined (Appendix 1), including an unjustified ♂ "allotype" (Gr. St. Bernhard Süd 2200 m 24.6.1953 // Schweiz leg. G. Frey // *Dichotrachelus valesiacus* STIERL. det. F. Stöcklein 1953 [handwritten; wrong determination] // Museum Frey Tutzing //

Dichotrachelus augusti SOLARI allotypus! ♂ det. G. Osella 1970 [partly handwritten]), which had been subsequently attributed by Osella (1970: 522) as type material to *augusti*, but is not part of it.

Within the examination of the material of *D. augusti*, I made an interesting discovery concerning the shape of its aedeagus. Based on the shape of the tip of the medianlobus, three preliminarily named forms I–III can be differentiated (Figs 18, 19 & 28). Form I is likely to be the typical form, as these specimens are from around the type locality. Form III was discovered in material from Col de Balme (solely two male specimens are known, and only one specimen contains an aedeagus (Fig. 19), whereas the other one is lost) at the border between Switzerland and France. Form II was discovered, during comparison of specimens from around the type locality (Champoluc) and from Great St Bernard/Val Ferret area. From this perspective, a record of *D. augusti* (a single female specimen) from the southern side of Valle d'Aosta (Fig. 28) is a further promising trace that should be followed up in the future.

For all these reported observations, only further specimens of *D. augusti*, which is obviously a species complex, will help to clarify the significance of these different forms. Special caution is needed within *Dichotrachelus* concerning the aedeagus-shape. Just recently Germann & Baur (2010) reported on two different forms of the aedeagus of *D. imhoffi* STIERLIN, 1857 present within all investigated populations.

As *D. augusti* has been only very rarely collected, the examination of mosses at similar – cold and rocky – places illustrated for *D. sondereggeri* sp. nov. (Figs 33–34) or also encountered during the finds of *D. augusti* at La Peule in Val Ferret (unpubl. observations) might be especially successful. A very recent excursion by M. Geiser in the summer of 2010 to Col de Balme collecting on drier and warmer grounds, exclusively yielded specimens of *D. rudeni* STIERLIN, 1853.

***Dichotrachelus sondereggeri* sp. nov.** (Figs 1–4, 17, 21, 24, 29–32)

Holotype ♂: Switzerland, Grisons, Valposchiavo, above Cavaione, Corn dal Solcun, Swiss coordinates: 804.200/ 126.229, 2480 m a.s.l., sifting mosses, 2. 7. 2009, leg. C. Germann. Red label: Holotype *Dichotrachelus sondereggeri* sp. nov. (NMBE).

Paratypes: 8 specimens. 2 ♂♂ and 3 ♀♀, same indications as holotype. Red labels: *Dichotrachelus sondereggeri* sp. nov. des. C. Germann 2011 (1 ♂, 1 ♀ cCG; 1 ♂, 1 ♀ NMBE; 1 ♀ NMLU); 1 ♀, (same data as holotype, cCG) is kept in 90% ethanol for potential DNA extraction; 1 ♀ (same data as holotype, cCG)



Fig. 1: *Dichotrachelus sondereggeri* sp. nov., male holotype (drawing by H.-P. Wymann).

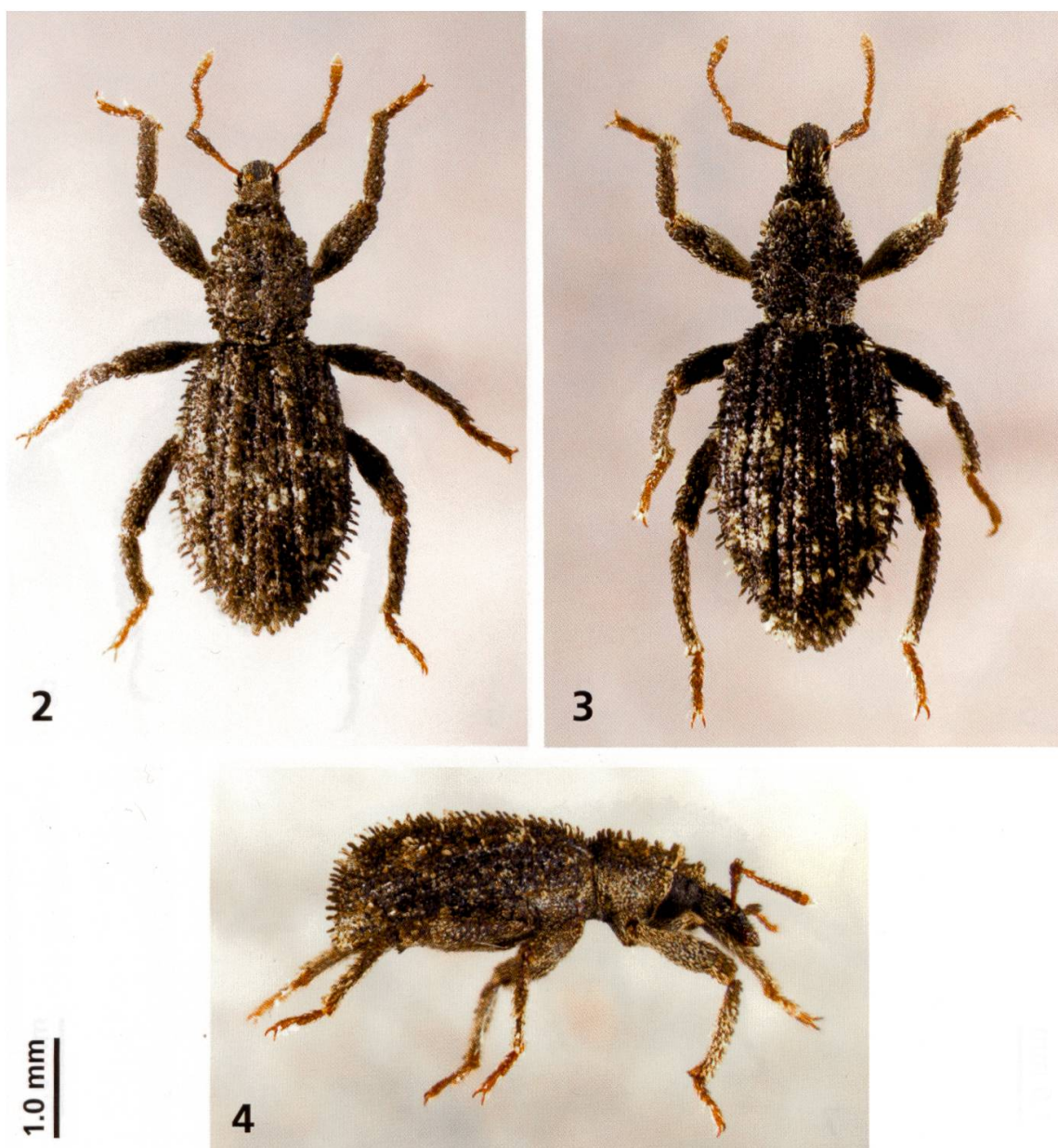
consists only of an abdomen (including elytra and all female genitalia, as well as fragments of 33 eggs); 1 ♀ Suisse, Grisons, s/ Cavajone [sic!], 18. 7. [19]94, pied rochers 2050–2100 m, leg. Cl. Besuchet. *Dichotrachelus* gr. *alpestris* STIERLIN det. Osella 1985 (*alpestris* n sp. ?). Red label: *Dichotrachelus sondereggeri* sp. nov. (MHNG, coll. G. Toumayeff).

Size: 3.8–4.9 mm (♂ 3.8–4.5 mm, ♀ 4.4–4.9 mm)

Body colour: Black to dark brown, antennae and tarsi reddish brown.

Head, rostrum and antennae: Head globose, irregularly punctate, raised broad dark brown scales on the front. Thinner scales from the epifrons up to the antennal scrobes. Eyes weakly protruding, almost circular. Rostrum about twice as long as wide (L/B): 1.8–2.1 (♂ 1.8–2.0, ♀ 1.8–2.1). The epifrons of the rostrum is shiny and irregularly striato-punctate. The rostral apex is glossy and shining, irregularly punctate and with raised setae. Antennal scrobes are visible from above. Antennae are strong and long, inserted before the middle of the rostrum. Antennal scape (L/B: 6.5) slender in its first third, then continuously broadened to three times its basal width. Bright setae and dark brown scales arise from the broad half of the antennal scape. First segment of antennal funiculus more than twice as long as wide, the following segments as follows (L/B): 2nd: 1.3, 3rd to 5th: 1.0, 6th: 0.85 and 7th: 0.6. The antennal club (L/B: 1.9) twice as wide as the last antennal segment, consisting of three visible segments.

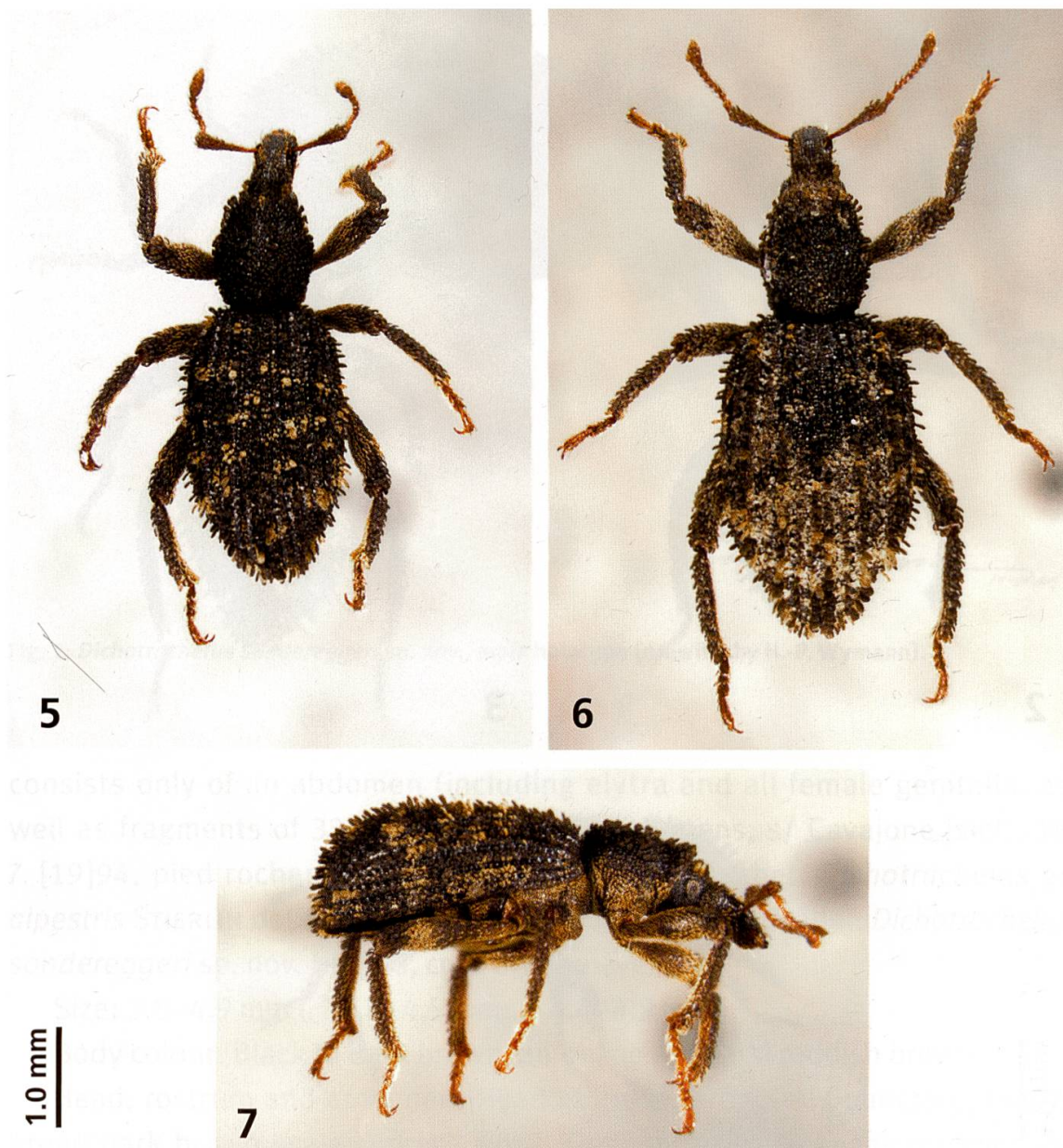
Pronotum: Index (L/B): 1.06–1.14. Somewhat longer than wide, laterally modestly rounded, widest in the middle. Vestiture consisting of adherent and



Figs 2–4: Dorsal and lateral views: 2) *Dichotrachelus sondereggeri* sp. nov. from Corn dal Solcun, male; 3) Ditto female; 4) Ditto male.

raised, strong, mainly dark brown scales, several light brown scales are inter-mixed.

Elytra: Index (L/B): 1.62–1.72. Base slightly broader than pronotum, sub-elliptical, without humeral callus (apterous), cone-shaped from the base on, widest shortly behind the middle. Uneven intervals including suture elevated, wider than the deeply punctate striae. Suture markedly bulged just before the decline of the elytra (best visible in lateral view). Integument consisting of two types of scales: semi-raised, short and rounded (often globular) scales, and raised scales, which are up to three times as long as wide. Scales are mostly dark brown; several patchily arranged light brown scales are inter-mixed.



Figs 5–7. Dorsal and lateral views: 5) *Dichotrachelus augusti* (form II from Val Ferret), male; 6) Ditto female; 7) Ditto male.

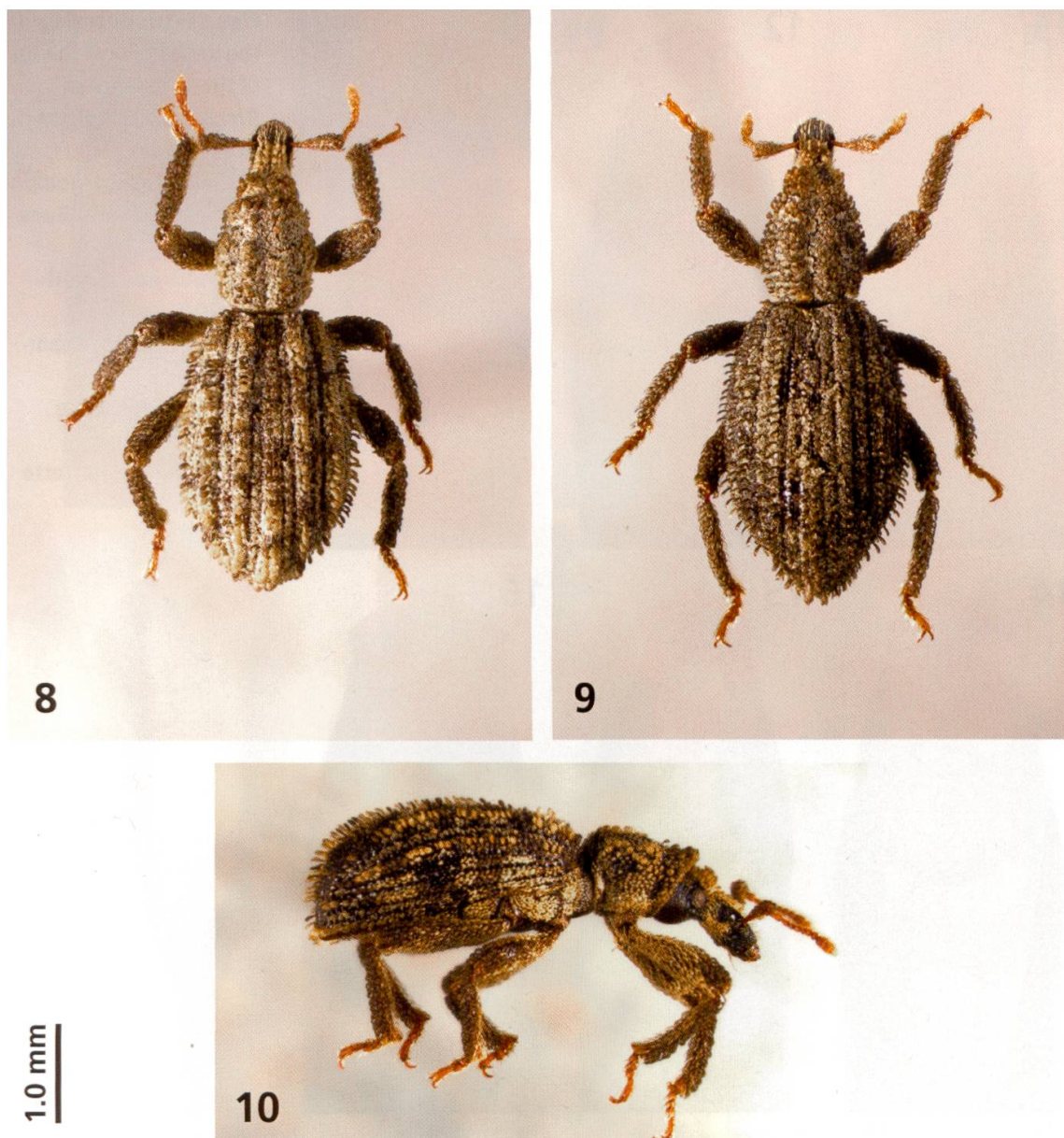
Legs: Strong and slender, three visible tarsal segments of about the same size, claw segment almost as long as the three visible tarsal segments, claws simple.

Aedeagus (Fig. 17): Apex of aedeagus abruptly attenuated and laterally moderately constricted before tip, fore margin weakly rounded.

Spiculum ventrale and spermatheca (Figs 21, 24)

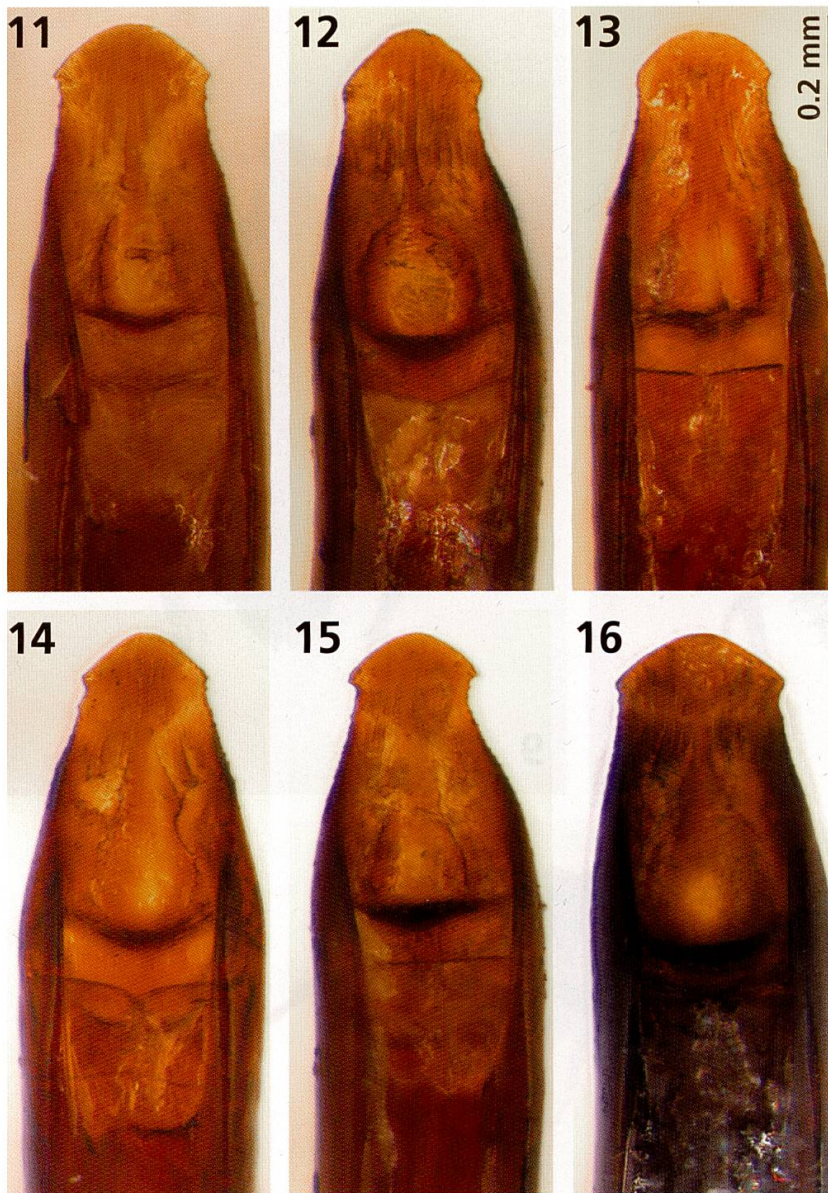
Sexual dimorphism: Elytral shape of male laterally more parallel (in females slightly convex). Fifth sternite of males shorter (B/L: 1.9–2.0) than females (1.0–1.3).

Differential diagnosis: The most conspicuous traits of *D. sondereggeri* sp. nov. are the elongated cone-shaped elytra with their maximal width behind



Figs 8–10: Dorsal and lateral views: 8) *Dichotrachelus alpestris* from Monte Viso, male; 9) Ditto from Anzeindaz, female; 10) Ditto male.

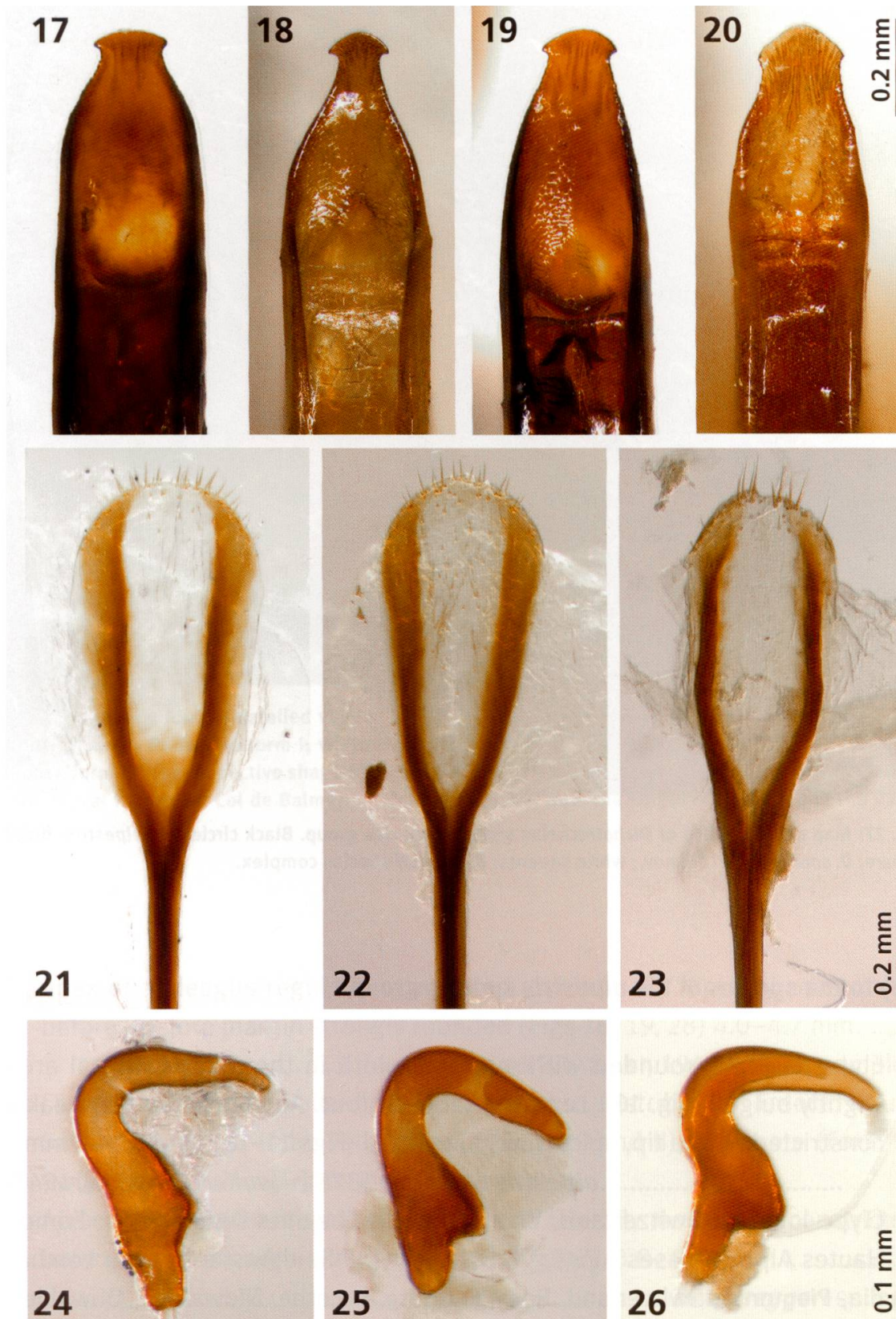
the middle (Figs 2–3), the long slender legs and the conspicuous apex of the aedeagus (Fig. 17). The presumably closest relative based on morphological characters is *D. augusti*, sharing the conspicuous strongly constricted apex of the aedeagus. To differentiate the species of the *alpestris* species group, all three species are keyed in the following. Although the shape and colour of the scales are often used for differential diagnoses in *Dichotrachelus*, this trait should be used only with care as considerable variation was found within the large series of specimens of *D. alpestris* from all over the distribution area. The spiculum ventrale of *D. alpestris* allows the unambiguous separation from all the other species of the group with its conspicuous rectangular branches (Fig. 23), whereas those of *D. sondereggeri* sp. nov. and *D. augusti* are very



Figs 11–16: Overview of the variability of the tip of the aedeagus of *Dichotrachelus alpestris*:

- 11) Waadt, Anzeindaz;
- 12) Ticino, Monte Genesio;
- 13) Valle Aosta, Colle Arietta;
- 14) Valle Aosta, Champorcher;
- 15) Piemonte, Colle della Lombarda;
- 16) Piemonte, Portette Valdieri.

similar. If spermathecae are compared, the available specimens of *D. augusti* all show a thicker plump cornu, whereas those of *D. sondereggeri* sp. nov. and *D. alpestris* are steadily tapered and thus more gracile (Figs 24–26).



Figs 17–26: Male and female genitalia. 17–20: Tip of aedeagus: 17) *Dichotrachelus sondereggeri* sp. nov. from Corn dal Solcun; 18, 19) forms II (Val Ferret), and III (Col de Balme) of *D. augusti* species complex; 20) *D. alpestris* from Anzeindaz. 21–23: Spiculum ventrale: 21) *D. sondereggeri* sp. nov. from Corn dal Solcun; 22) *D. augusti* form II from Val Ferret; 23) *D. alpestris* from Anzeindaz. 24–26: Spermatheca: 24) *D. sondereggeri* sp. nov. from Corn dal Solcun; 25) *D. augusti* form II from Val Ferret; 26) *D. alpestris* from Anzeindaz.

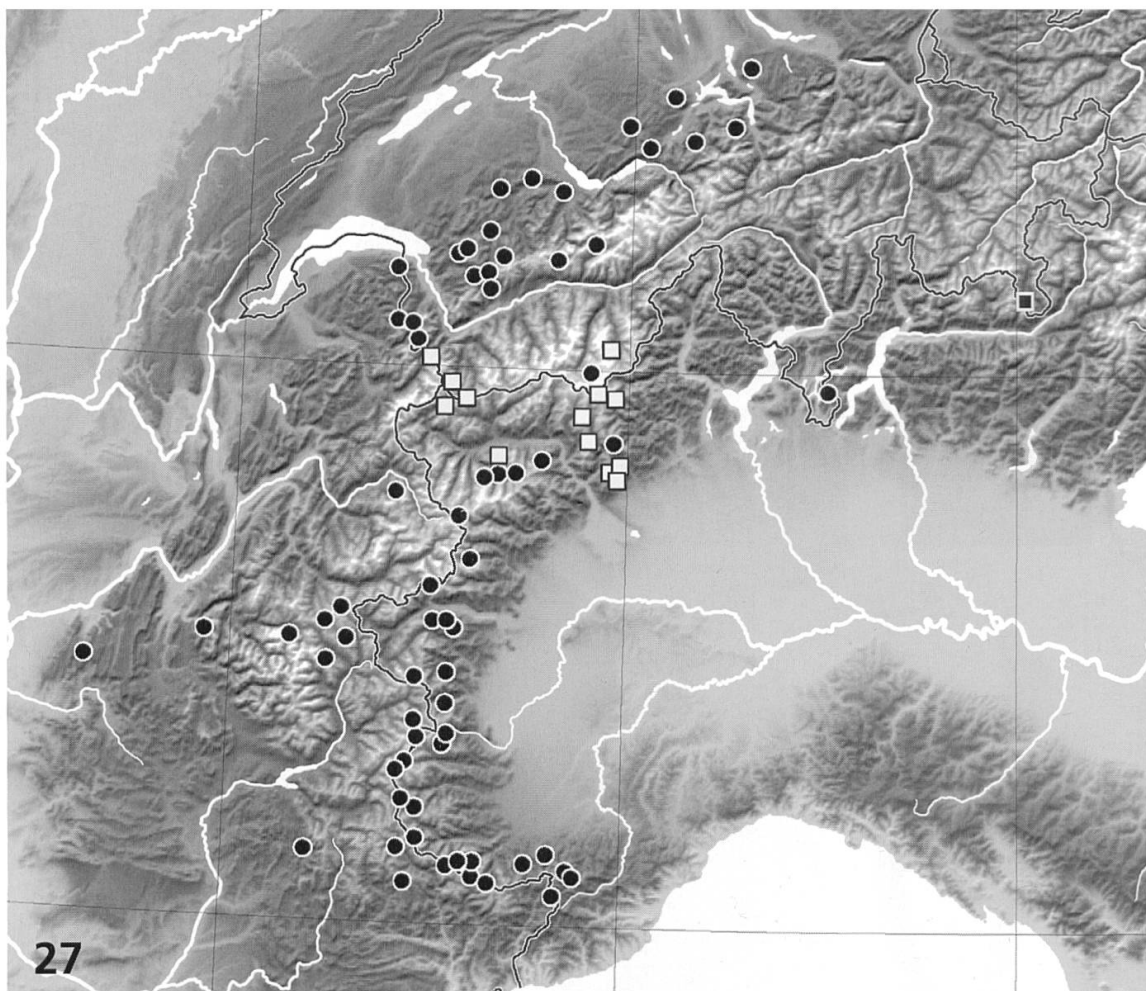


Fig. 27: Map showing sites of *Dichotrachelus alpestris* species group. Black circles: *D. alpestris*; black square: *D. sondereggeri* sp. nov.; white squares: *D. augusti* species complex.

Key to the species of the *alpestris* species group

- 1 Elytra laterally rounded with maximal width in the middle. Discal area slightly bulged (Fig. 10). Legs shorter and stout. Apex of aedeagus weakly constricted before tip, apical margin pointed (Figs 11–16, 20) 3.2–4.6 mm.
.....*alpestris* STIERLIN, 1878 (= *walteri* BARAJON, 1947)
(Type locality: Switzerland, Waadt, Col de Cheville. Distribution: France, Hautes Alpes, Basses Alpes, Vercors; Italy, Valle d'Aosta, Liguria, Lombardia, Piemonte; Switzerland, Bern, Fribourg, Lucerne, Nidwalden, Obwalden, Schwyz, Ticino, Valais, Waadt)
- Elytra elongated and slightly cone shaped from the base on with maximal width in or shortly behind the middle. Discal area flattened (Figs 4, 7). Legs longer and slender. Apex of aedeagus constricted before tip, apical margin rounded (Figs 17–19, 28) 2

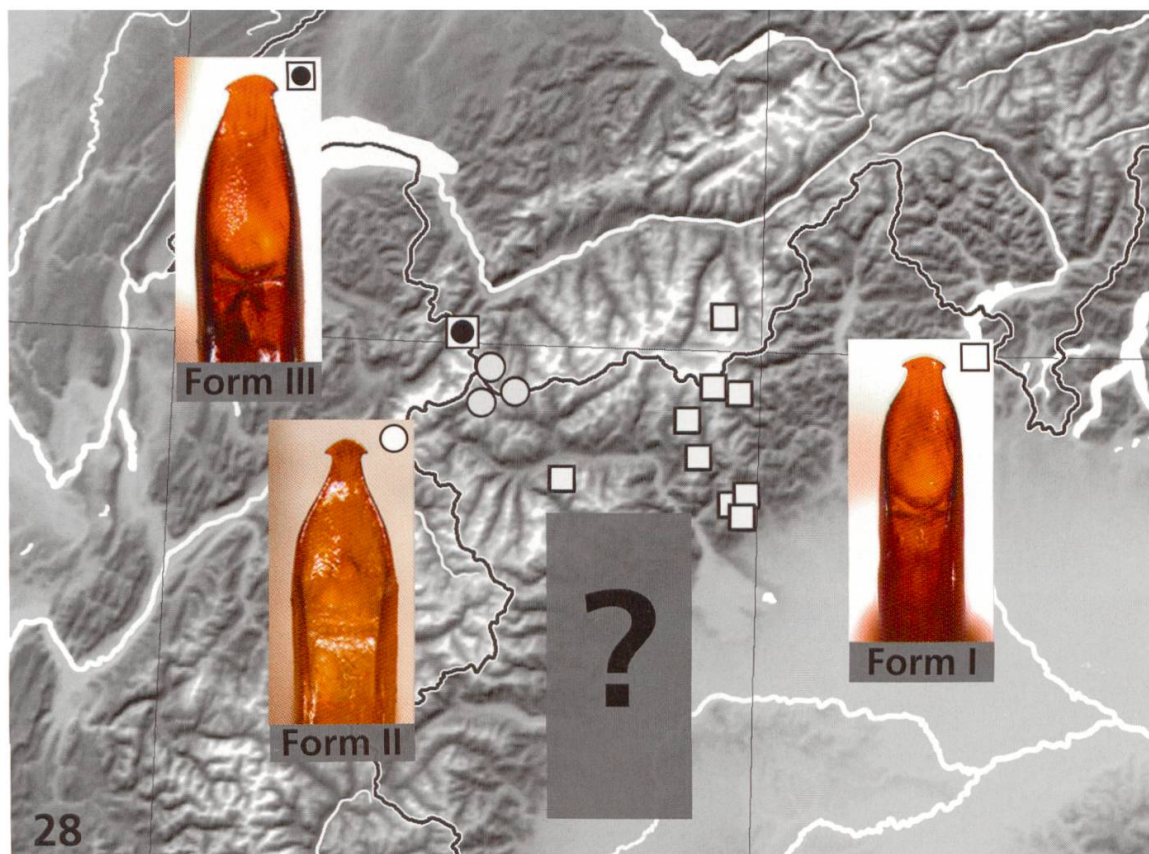
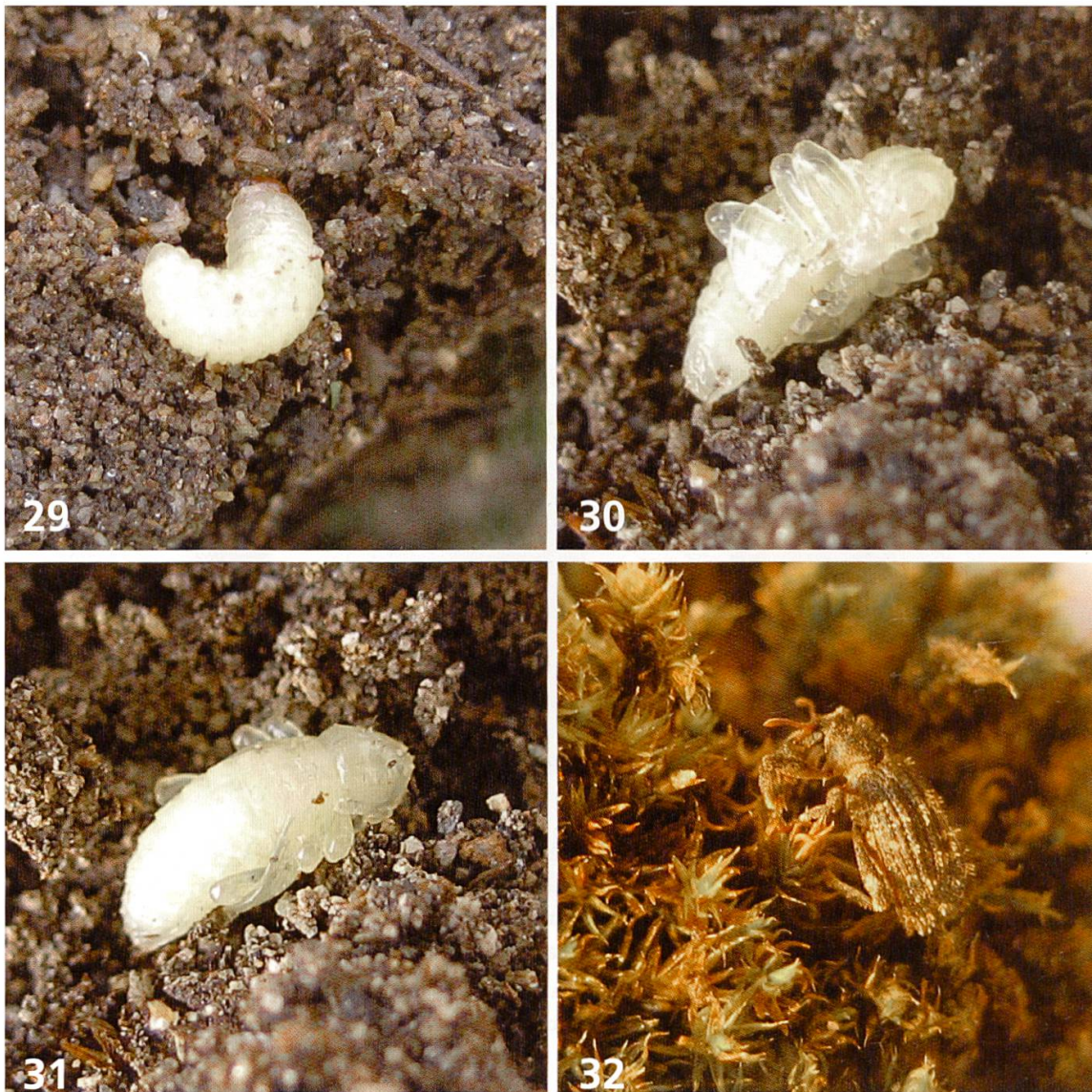


Fig. 28: Map providing a detailed view of the sites of the *Dichotrachelus augusti* species complex. White squares: *D. augusti* form I; white circles: *D. augusti* form II; black circle in white square: *D. augusti* form III. The respective shape of the apex of the aedeagus is pictured (I: Valle Aosta, Col Ranzola; II: Val Ferret; III: Col de Balme); no data is available from the single record south of the Valle d'Aosta.

- 2 Apex of aedeagus regularly attenuated and laterally strongly constricted before tip, fore margin strongly rounded (Figs 18, 19, 28) 4.0–4.7 mm.
.....*augusti* F. SOLARI, 1946 species complex
(Type locality: Italy, Valle d'Aosta, Champoluc. Distribution: France, Haute Savoie (Form III); Italy, Valle d'Aosta (Forms I and II), Piemonte (Form I); Switzerland, Valais (Forms I to III))
- Apex of aedeagus abruptly attenuated and laterally moderately constricted before tip, fore margin weakly rounded (Fig. 17), 3.8–4.9 mm.
.....*sondereggeri* sp. nov.
(Type locality: Switzerland, Grisons, Valposchiavo, Corn dal Solcun. Distribution: type locality)



Figs 29–32: Different stages of *Dichotrachelus sondereggeri* sp. nov.: 29) last instar larva just before pupation; 30) pupa ventral view; 31) pupa dorsal view; 32) freshly hatched imago. Fotos: C. Germann.

Distribution (Figs 27, 28, Appendix 1)

Dichotrachelus alpestris shows the major distribution of the group. The most eastern finds I know are fairly isolated on the top of Monte Generoso in the canton Ticino. *D. augusti* form I is restricted to Valle d'Aosta, around the Monte Rosa massif, northwards to the Saas Valley. Form II is known from Great St Bernard, including Val Ferret in Switzerland. Form III is presently only known from Col de Balme. *D. sondereggeri* sp. nov. is exclusively known from Corn dal Solcun in the Valposchiavo.

Bionomy: *D. sondereggeri* sp. nov. lives in moss cushions (Bryophyta, Musci) of *Grimmia* cf. *sessitana* DE NOT., *Racomitrium heterostichum* (HEDW.) BRID., and *Tortella tortuosa* (HEDW.) LIMPR. Four larvae were found at the type



Figs 33–34. Biotope of *Dichotrachelus sondereggeri* sp. nov. on Corn dal Solcun (2480 m a.s.l.): 33) side peak in loose rocks providing a cold and humid microclimate where moss cushions with larvae were found; 34) detailed view of those moss cushions. Fotos: C. Germann.

locality (Corn dal Solcun), one in the presumably second, and three in the last larval instar (Fig. 29). Very soon, on July 6th, one larva pupated under room temperature conditions (Figs 30, 31). The imago hatched about one week later (Fig. 32). Two of the paratype specimens were also freshly emerged when collected. I conclude that *D. sondereggeri* sp. nov. may develop within one season. *D. sondereggeri* sp. nov. was exclusively found in or near moss cushions within small scree slopes at the very top of Corn dal Solcun (Figs 33, 34) between 2300–2500 m a.s.l. However, the single specimen collected by C. Besuchet at the foot of a rock was found at a somewhat lower altitude (2050–2100 m a.s.l.), where dwarf shrub heath dominates the vegetation (Fig. 35).

Derivation of species name: The new species *Dichotrachelus sondereggeri* is named after the renowned expert of various lepidopteran groups, co-founder and co-author of the famous standard work for lepidopterologists "Schmetterlinge und ihre Lebensräume" and author of "Die Erebien der Schweiz", gifted field entomologist and amiable colleague Peter Sonderegger (Brügg).



Fig. 35: View from about 2100 m a. s. l. to Corn dal Solcun. *Dichotrachelus sondereggeri* sp. nov. was found in a single exemplar collected by C. Besuchet at this lower altitude. Foto: C. Germann.

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Appendix 1: Finding locations of species of the *Dichotrachelus alpestris* species group as basis for the distribution map (Fig. 27). Acronyms: ct = canton; cy = country; alt = altitude (in m a. s. l.); N = number of specimens examined; d/m/y = day, month, year; ref = references: 1) Osella (1967), 2) Osella (1970), 3) Scherler (1995), 4) Meregalli (1980), 5) Meregalli (1982).

species	cy	ct	location	alt	leg	coll	N	d	m	y	ref
<i>alpestris</i>	CH	BE	Gantrisch, Bürglen, Rüchi	1750	C. Germann	cCG	1	30	5	1998	
<i>alpestris</i>	CH	BE	Gstaad, Gummfluh	1850	C. Germann	cCG	1	29	5	2004	
<i>alpestris</i>	CH	BE	Niesen	-	P. Scherler	NMBE	1	29	7	2002	
<i>alpestris</i>	CH	BE	Rothorn, Brienz	-	P. Scherler	NMBE	1	11	8	2000	
<i>alpestris</i>	CH	FR	Schafberg	2100	A. Szallies	NMBE	1	5	6	2010	
<i>alpestris</i>	CH	LU	Schrattenfluh	2000	A. Szallies	NMBE	1	6	6	2010	
<i>alpestris</i>	CH	NW	Pilatus	2050	W. Schiller	cWS	5	2	8	1983	
<i>alpestris</i>	CH	OW	Huetstock		A. Szallies	cAS					
<i>alpestris</i>	CH	SZ	Kaiserstock		A. Szallies	cAS					
<i>alpestris</i>	CH	TI	Monte Generoso	1610	P. Scherler	NMBE	1	13	8	1970	
<i>alpestris</i>	CH	TI	Monte Generoso	1650	C. Germann	cCG	1	9	8	2001	
<i>alpestris</i>	CH	UR	Uri Rotstock, Isenthal	2300	A. Szallies	cAS	1	15	8	2009	
<i>alpestris</i>	CH	VD	Anzeindaz	-	P. Scherler	NMBE	1	19	9	1970	
<i>alpestris</i>	CH	VD	Anzeindaz, Conche	-	P. Scherler	NMBE	8	24	7	1955	
<i>alpestris</i>	CH	VD	Col Cheville	-							1
<i>alpestris</i>	CH	VD	Col des Mosses, Lac Lioson	1800	C. Germann	cCG	1	29	6	2007	
<i>alpestris</i>	CH	VD	Ormont-Dessous, Lapiaz de Mayen-Famelon	-	P. Scherler	NMBE	1	18	8	1983	
<i>alpestris</i>	CH	VS	Chamossaire	2100	C. Besuchet		1	8	7	1961	3
<i>alpestris</i>	CH	VS	Col de Bretolet	-	P. Scherler	NMBE	6	2	9	1986	
<i>alpestris</i>	CH	VS	Emosson	-	P. Scherler	NMBE	2	2	10	1986	
<i>alpestris</i>	CH	VS	Gemmi	-	A. Sermet	NMBE	2	-	8	1972	
<i>alpestris</i>	CH	VS	Gemmi	-	P. Scherler	NMBE	2	20	7	1987	
<i>alpestris</i>	CH	VS	Grammont	2000	C. Besuchet		1	30	6	1984	3
<i>alpestris</i>	CH	VS	Salanfe	-	P. Scherler	NMBE	2	5	9	1986	
<i>alpestris</i>	CH	VS	Susanfe	-	P. Scherler	NMBE	1	7	8	1986	
<i>alpestris</i>	CH	VS	Val d'Illiez, Col de Bretolet	1750	C. Germann	cCG	1	15	7	2007	
<i>alpestris</i>	CH	VS	Zermatt, Gornergrat	-	A. Sermet		1	-	7	1972	3
<i>alpestris</i>	F		Alpi Cozie, Queyras, Montagne de la Lauze	-							2
<i>alpestris</i>	F		Briançonnais, Col de Muandes	-							2
<i>alpestris</i>	F		Briançonnais, Col du Lautaret	-							2
<i>alpestris</i>	F		Briançonnais, Col du Nevache	-							2
<i>alpestris</i>	F		Briançonnais, Col du Vallon	-							2
<i>alpestris</i>	F		Dorsale del Jallorgues: Col di Jallorgues	-							1
<i>alpestris</i>	F		Mont Pelvoux	-							1
<i>alpestris</i>	F		Mont Saint Honorat	-							1
<i>alpestris</i>	F		Montagne de la Boule, Faille-feu	-							1
<i>alpestris</i>	F		Monte de la Blanche, Les Trois Evêchés	-							1
<i>alpestris</i>	F		Monte Oronaye, Larche au Lauzonier	-							1

species	cy	ct	location	alt	leg	coll	N	d	m	y	ref
<i>alpestris</i>	F		Monte Pelvoux, Col du Vallon	-							1
<i>alpestris</i>	F		Vercors, Col de la Bataille	1400	C. Germann	cCG	1	16	10	2001	
<i>alpestris</i>	F		Vercors, Petite Moucherolle	-							2
<i>alpestris</i>	I		A. Cozie, Val Chisone, Rif. Granero	2300	G. Osella	cCG	1	-	7	1968	
<i>alpestris</i>	I		Alpe Marittime, L. Portette Valdieri	-	M. Barajon	cMB	20	26	7	1952	
<i>alpestris</i>	I		Alpe Marittime, Passo delle Saline	2200	M. Barajon	cMB	4	20	6	1951	
<i>alpestris</i>	I		Alpe Marittime, Terme di Valdieri	-	M. Barajon	cMB	1	12	8	1951	
<i>alpestris</i>	I		Alta Val Pesio, Porta Sestrera	-							2
<i>alpestris</i>	I		Colle della Lombarda	-							1
<i>alpestris</i>	I		Colle della Vecchia	-							2
<i>alpestris</i>	I		Liguria, Viozene	2000	M. Barajon	cMB	2	29	5	1950	
<i>alpestris</i>	I		Limonetto Piemonte	-							1
<i>alpestris</i>	I		Madonna d. Finestre	-	J. Breit	NMBA	5	-	-	-	
<i>alpestris</i>	I		Madonna d. Finestre	-	A. Doderio	NMBA	1	-	8	1903	
<i>alpestris</i>	I		Marguareis, Alta Val Pesio	-							1
<i>alpestris</i>	I		Moncenisio	-							1
<i>alpestris</i>	I		Monte Gelas, Forte Lombard, Val Gesso della Bara	-							1
<i>alpestris</i>	I		Monte Oronaye, Colle di Mulo, sopra Sambuco	-							1
<i>alpestris</i>	I		Monte Viso	-	R. Pinker	NMBA	1	6	6	1906	
<i>alpestris</i>	I		Monte Viso	-	R. Pinker	NMBA	1	7	6	1906	
<i>alpestris</i>	I		Monte Viso	-	R. Pinker	NMBA	1	1	7	1907	
<i>alpestris</i>	I		Monte Viso	-	R. Pinker	NMBA	1	14	6	1906	
<i>alpestris</i>	I		Monte Viso	-	R. Pinker	NMBA	2	-	6	1906	
<i>alpestris</i>	I		Monte Viso, Plan della Regina	1800	C. Germann	cCG	1	8	7	2004	
<i>alpestris</i>	I		Monviso, Monte Viso	-							1
<i>alpestris</i>	I		Piemonte, Bussoleno, M. Orsiera	-	M. Barajon	cMB	6	1	8	1949	
<i>alpestris</i>	I		Piemonte, Cuneo, Demonte, Valle d'Arma, colle del Mulo	2500	V. Rosa	cVR	26	-	8	1972	
<i>alpestris</i>	I		Piemonte, Val di Ala P. Mussa	2000	M. Barajon	cMB	5	12	8	1950	
<i>alpestris</i>	I		Queyron, alta Val Germanasca	-							1
<i>alpestris</i>	I		Testa del Malinvern, Col del Druos	-							1
<i>alpestris</i>	I		Val d'Orgials, Colle d. Lombarda	2370	C. Germann	cCG	2	10	7	2003	
<i>alpestris</i>	I		Valle di Locana, Lago Serrù	-							2
<i>alpestris</i>	I		Testa del Malinvern, Terme di Valdieri	-							1
<i>alpestris</i>	I/F		Alpe Liguri, Monte Bertrand	-							2
<i>alpestris</i>	I/F		Alpe Marittime, Col de Fenêtre	-							2
<i>alpestris</i>	I/F		Alpe Marittime, Col de Fremamorta	-							2
<i>alpestris</i>	I/F		Alpe Marittime, Pic de l'Arpette	-							2
<i>alpestris</i>	I/F		Alpi Cozie, Colle di San Veran	-							2
<i>alpestris</i>	I/F		Alpi Graie, Colle dell'Autaret	-							2
<i>alpestris</i>	I/F		Col d'Orsiera	-	R. Pinker	NMBA	1	25	6	1908	
<i>alpestris</i>	I/F		Col S. Véran	-	Stöcklein	NMBA	1	1	8	-	
<i>alpestris</i>	I/F		Gapençais	-							1
<i>alpestris</i>	I/F		Madonna di Finestre	-							1
<i>alpestris</i>	I/F		Monte Tinibras, Col di Tortissa	-							1
<i>alpestris</i>	I/F		Monte Tinibras, S. Stefano di Tinea	-							1
<i>alpestris</i>	I/F		Monte Uia/Monte Orsiera, Coazze	-							1
<i>alpestris</i>	I/F		Monviso, Col dell' Agnello	-							1
<i>alpestris</i>	I/F		Val d'Albergian	-	R. Pinker	NMBA	3	23	6	1908	

species	cy	ct	location	alt	leg	coll	N	d	m	y	ref
<i>alpestris</i> (<i>walteri</i> , syn. nov.)	I		Aosta, Dondena, Champorcher	2400	V. Rosa	cVR	12	18	8	1978	
<i>alpestris</i> (<i>walteri</i> , syn. nov.)	I		Col della Finestra di Camporcher	-							2
<i>alpestris</i> (<i>walteri</i> , syn. nov.)	I		Col della Nuova (= Colle dell'Arietta)	-							2
<i>alpestris</i> (<i>walteri</i> , syn. nov.)	I		Gran Paradiso, Colle dell'Arietta	-							1
<i>alpestris</i> (<i>walteri</i> , syn. nov.)	I		Piemonte, G. Paradiso, C. Arietta	-	M. Barajon	cMB	4	15	7	1946	
<i>alpestris</i> (<i>walteri</i> , syn. nov.)	I		Rifugio Valle Sella, Valnontey	-							2
Specimens examined							144				
<i>augusti</i> form I	CH	VS	Saas-Fee	-	A. Linder	ETHZ	1	-	7	1951	3
<i>augusti</i> form I	I		Aosta, Brusson Col Ranzola	2000	V. Rosa	cVR	5	2	7	1978	
<i>augusti</i> form I	I		Biella, Santuario di Graglia	-							4
<i>augusti</i> form I	I		Cervino, Champoluc	-							1
<i>augusti</i> form I	I		M. Rosa Alpe Testanera	-	R. Monguzzi	cVR	1	14	8	1971	
<i>augusti</i> form I	I		Monte Gregorio/Monte Mars, Quassolo	-							1
<i>augusti</i> form I	I		Monte Rosa, Alagna	-							1
<i>augusti</i> form I	I		Monte Rosa, Monte Camino	-							1
<i>augusti</i> form I	I		Monte Rosa, Mt. Bo	-							1
<i>augusti</i> form I	I		Piedicavallo, Alta Valle Cervo	2000	A. Focarile	cVR	1	15	8	1945	
<i>augusti</i> form I	I		Piedicavallo, M. Bo	-	M. Barajon	cMB	2	5	7	1946	
Specimens examined							10				
<i>augusti</i> form II	CH	VS	Val Ferret, Ban Darray	-	P. Scherler	NMBE	1	9	8	1957	
<i>augusti</i> form II	CH	VS	Val Ferret, La Peule	2460	C. Germann	cCG	3	17	7	2007	
<i>augusti</i> form II	I		Gran San Bernardo	-		NMBA	2				2
<i>augusti</i> form II	I		Valle d'Aosta, Val Ferret	-							5
Specimens examined							6				
<i>augusti</i> form ?	I		Aosta, Pila, Lago di Chamolé	2350	V. Rosa	cVR	1	2	8	1978	
Specimens examined							1				
<i>augusti</i> form III	CH	VS	Col de Balme	-	P. Scherler	NMBE	1	10	7	1955	
<i>augusti</i> form III	CH	VS	Col de Balme	-	A. Sermet	NMBE	1	10	7	1955	
Specimens examined							2				
<i>sondereggeri</i> sp. nov.	CH	GR	Valle Poschiavo, Cavaione	2050- 2100	C. Besuchet	MHNG	1	18	7	1994	
<i>sondereggeri</i> sp. nov.	CH	GR	Valle Poschiavo, Cavaione, Corn dal Solcun	2480	C. Germann	NMBE, NMLU, cCG	8	2	7	2009	
Specimens examined							9				

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