

On the distinction between *Ampedus auripes* (Reitter, 1895) and *Ampedus nigrinus* (Herbst, 1784) (Coleoptera: Elateridae)

Anmerkung zur Unterscheidung von *Ampedus auripes* (Reitter, 1895) und *Ampedus nigrinus* (Herbst, 1784) (Coleoptera: Elateridae)

Andrea JARZABEK-MÜLLER¹⁾ & Jörg MÜLLER²⁾

1) Anton-Hilz-Strasse 42, 94566 Riedlhütte, Germany
andrea_jarzabek@yahoo.de

2) Nationalparkverwaltung Bayerischer Wald, Freyunger Strasse 2, 94481 Grafenau, Germany
joerg.mueller@npv.bayern.de

Abstract. Status of *Ampedus auripes* (Reitter, 1895) was long considered to be controversial. Only relatively few specimens were known in total. Based on 363 individuals of the species from the Bavarian Forest, the most important characters described in the literature were checked. Additionally, further morphological characters validating the separation of *Ampedus auripes* from *Ampedus nigrinus* (Herbst, 1784) were discovered: venation of the metathoracic wings, shape of the lateral edge of pronotum and the appearance of ventral vestiture. 14 of the specimens studied could not be identified as belonging to either of these two species. The morphological characters of these possible “hybrids” are herein illustrated and described.

Zusammenfassung. *Ampedus auripes* (Reitter, 1895) galt lange Zeit als umstrittene Art. Insgesamt waren nur relativ wenige Exemplare bekannt. Auf der Basis von 363 Individuen der Art aus dem Bayerischen Wald wurden die wichtigsten in der Literatur beschriebenen Merkmale überprüft. Zusätzlich wurden als weitere morphologische Merkmale die Hautflügel, der Halsschildseitenrand und die ventrale Behaarung für die Unterscheidung von *Ampedus auripes* und *Ampedus nigrinus* (Herbst, 1784) ergänzt. 14 der untersuchten Individuen konnten nicht eindeutig einer der beiden Arten zugeordnet werden. Die morphologischen Merkmale dieser möglichen „Hybriden“ werden dargestellt und beschrieben.

Key words: Coleoptera, Elateridae, Elaterinae, Ampedini, *Ampedus auripes*, *Ampedus nigrinus*, morphological characters

Introduction

Until recently (Wurst & Kaupp, 1995), *Ampedus auripes* (Reitter, 1895) was considered to fall within the range of variation of *Ampedus nigrinus* (Herbst, 1784). Following the comparison of material from various collections, *A. auripes* was once more accorded the status of a valid species by Wurst & Kaupp (1995), who also summarized constant characters for the reliable separation of the two species. Their study was, however, based on a restricted number of individuals, which hindered interpretation of the identification characters. In the course of a research project undertaken by the staff of the Bavarian Forest National Park, 363 individuals of *A. auripes* were collected. Never before has this much-discussed species been found in such numbers. Objective of this study is to check and augment the previously known most important characters of *A. auripes*, using the extensive material and data from the Bavarian Forest, as well as to document the characters of the possible “hybrids”.

Study area and methods

The study area in the Bavarian Forest reaches from 650 m to 1420 m a.s.l.. A detailed description is given in Bässler et al. (2008). To ensure a standardized survey of the arthropod fauna along the altitudinal gradient, four transects were established at different heights and in different areas (Lackenberg, Rachel, Plattenhauser). Insects were sampled with window electors placed every 100 m along the transects, with Malaise traps placed on specially selected sections: in total 181 window electors and 36 Malaise traps were used. These sampling methods were supplemented by

hand collecting on logs and snags. Sampling period was from May to October 2007. With all sampling methods, 363 individuals of *A. auripes* and 329 individuals of *A. nigrinus* were recorded. Of these, 357 specimens of *A. auripes* and 329 specimens of *A. nigrinus* were caught with electors. Only six *A. auripes* und 26 *A. nigrinus* were caught with Malaise traps. Hand collecting yielded no *A. auripes*, but it provided eight *A. nigrinus*. 14 of the sampled specimens could not be clearly identified as *A. auripes* or *A. nigrinus*. These possibly hybrid specimens are discussed further in section „Hybrid“. Comparison of sampling methods shows that flight window traps are a very effective method for recording the high montane click beetles.

Results and discussion of morphological characters of *Ampedus auripes* (Reitter) in comparison with *Ampedus nigrinus* (Herbst)

Body size. Measurements of 302 individuals of *Ampedus auripes* yielded a body size ranging from 7.50 to 10.00 mm (median 8.90 mm) for females (n=104) and 7.10 to 9.50 mm (median 8.20 mm) for males (n=198). A range in size from 7.10 to 10.00 mm results for all individuals (Fig. 1). Reitter (1895, 1918) and Kuhnt (1911) give a length of 9.50 mm. Whilst Laibner (2000) measured lengths from 8.00 to 9.50 mm, the range in Wurst & Kaupp (1995) lies between 9.50 and 10.50 mm. Collating all these results, a body size of 7.10 to 10.50 mm can be established.

Measurements of *A. nigrinus* were not made, because sufficient data for this species were already available. The body size lies between 6.00 and 9.00 mm (Reitter (1911, 1918), Kuhnt (1911), Leseigneur (1972), Freude et al. (1979), Gurjeva (1979), Dolin (1988), Platia (1994), Laibner (2000)).

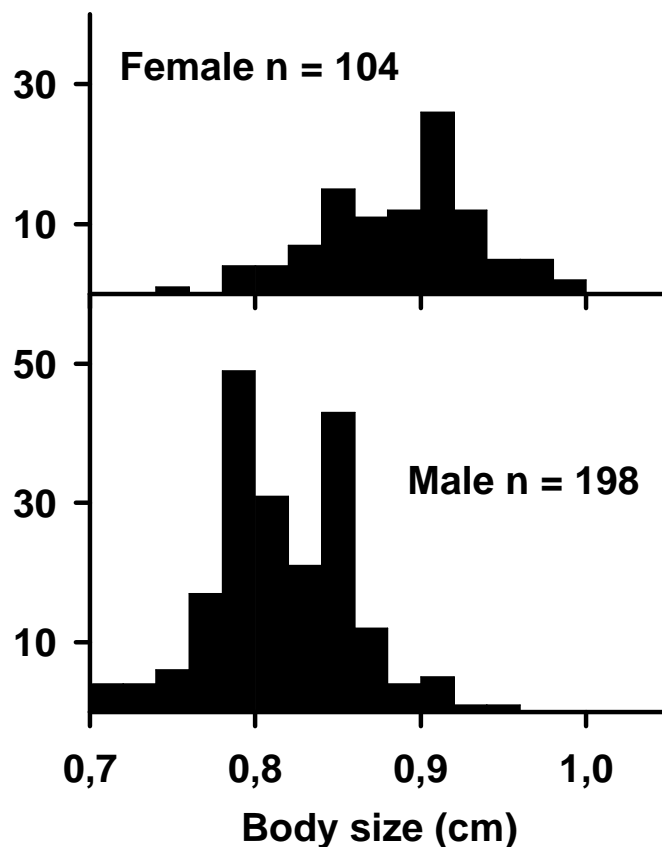


Fig. 1. Histogram of the distribution of body sizes of both sexes of *Ampedus auripes* (Reitter) n=302
Histogramm über die Körpergrößenverteilung der beiden Geschlechter von *A. auripes* (Reitter) n=302

Body shape and appearance. The parallel-sided body shape of *Ampedus auripes*, described amongst others by Reitter (1895, 1911, 1918), Kuhnt (1911), Wurst (1992) and Wurst & Kaupp (1995), has proved to be a constant character. The narrowing of the elytra begins approximately in the posterior third, whilst in *A. nigrinus* this starts at about the middle (Figs. 2-5). Identification of females of *A. auripes* was difficult in some cases, because females of *A. nigrinus* are often very large and tend to have a parallel-sided body. Therefore it was especially important to check all the morphological characters of large female specimens of the above-mentioned species.

The reddish brown legs and deeply incised elytral grooves of *Ampedus auripes* are also mentioned by many authors as good distinguishing characters (Reitter (1895, 1911, 1918), Kuhnt (1911), Wurst (1992), Wurst & Kaupp (1995), Laibner (2000)). The latter character is often more pronounced in female than in male. Both characters are, however, hardly helpful for determination, because of their variable degree of expression.



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Fig. 2. Body shape and appearance of the female of *Ampedus auripes* (Reitter); dorsal view.

The narrowing (dashed line) of the elytra begins at the posterior third approximately.

Habitus und Erscheinungsbild des Weibchens von *Ampedus auripes* (Reitter); dorsal.

Die Verengung (Strich-Strich) der Flügeldecken beginnt ungefähr im untersten Drittel.



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Fig. 3. Body shape and appearance of the female of *Ampedus nigrinus* (Herbst); dorsal view.

The narrowing (dashed line) of the elytra begins at the posterior half (dash-dotted line) approximately.

Habitus und Erscheinungsbild des Weibchens von *Ampedus nigrinus* (Herbst); dorsal.

Die Verengung (Strich-Strich) der Flügeldecken beginnt ungefähr ab der Hälfte (Strich-Punkt) der Elytren.



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Fig. 4. Body shape and appearance of the male of *Ampedus auripes* (Reitter); dorsal view. The narrowing (dashed line) of the elytra begins at the posterior third approximately.
Habitus und Erscheinungsbild des Männchens von *Ampedus auripes* (Reitter); dorsal.
Die Verengung (Strich-Strich) der Flügeldecken beginnt ungefähr im untersten Drittel.



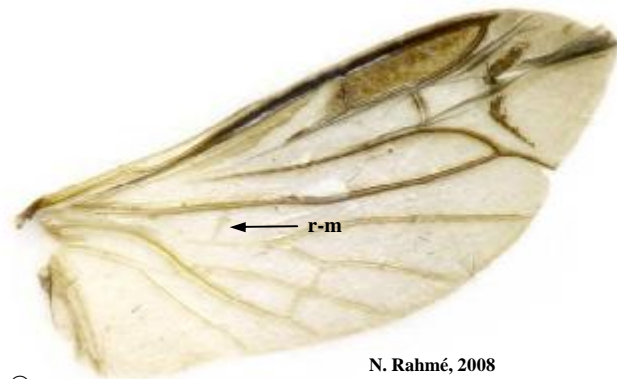
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Fig. 5. Body shape and appearance of the male of *Ampedus nigrinus* (Herbst); dorsal. The narrowing (dashed line) of the elytra begins at the posterior half (dash-dotted line) approximately.
Habitus und Erscheinungsbild des Männchens von *Ampedus nigrinus* (Herbst), dorsal.
Die Verengung (Strich-Punkt) der Flügeldecken beginnt ungefähr ab der Hälfte (Strich-Punkt) der Elytren.

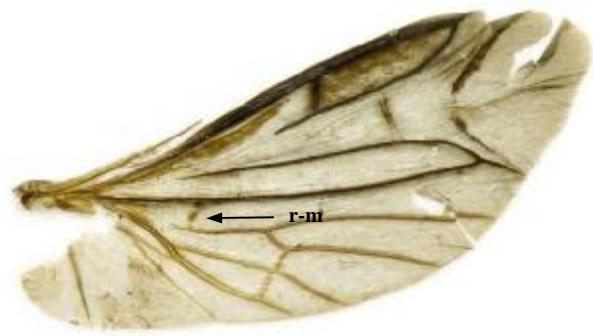
Sclerotization of the radio-medial (r-m) crossvein of the hind metathoracic wings as an identification character. The sclerotization of the membranous hind metathoracic wings plays an important role in the identification of Diptera, Hymenoptera and other insects. In the Coleoptera, Elateridae in particular, this character has scarcely been used, with the exception of the work of Tarnawski (2000), who used it to identify genera. In the examination of over 300 individuals of *Ampedus auripes* and at least as many *A. nigrinus*, the hind metathoracic wings of each specimen were prepared. It was found that in 92% of *A. auripes* specimens, that the radio-medial (r-m)¹ crossvein (Fig. 6, 8) is weakly or very weakly sclerotized. This applies to both sexes of this species. In the remaining 8% this character is not so clear. In every case, the sclerotization of the radio-medial (r-m) crossvein in *A. nigrinus* is strongly or very strongly developed (Fig. 7, 9). This character proved to be very helpful in the determination of *A. auripes* in other projects undertaken by the Bavarian and Czech National Parks.

¹ Terminology according to Comstock-Needham System (Triplehorn & Johnson, 2005)



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Fig. 6. Metathoracic wing of a female *Ampedus auripes* (Reitter). Arrow indicates the weakly sclerotized radio-medial (r-m) crossvein.
Hautflügel (Alae) eines Weibchens von *Ampedus auripes* (Reitter). Der Pfeil zeigt die schwach sklerotisierte radio-medial (r-m) crossvein.



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Fig. 7. Metathoracic wing of a female *Ampedus nigrinus* (Herbst). Arrow indicates the strongly sclerotized radio-medial (r-m) crossvein.
Hautflügel (Alae) eines Weibchens von *Ampedus nigrinus* (Herbst). Der Pfeil zeigt die stark sklerotisierte radio-medial (r-m) crossvein.



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Fig. 8. Metathoracic wing of a male *Ampedus auripes* (Reitter). Arrow indicates the weakly sclerotized radio-medial (r-m) crossvein.
Hautflügel (Alae) eines Männchens von *Ampedus auripes* (Reitter). Der Pfeil zeigt die schwach sklerotisierte radio-medial (r-m) crossvein.



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Fig. 9. Metathoracic wing of a male *Ampedus nigrinus* (Herbst). Arrow indicates the strongly sclerotized radio-medial (r-m) crossvein.
Hautflügel (Alae) eines Männchens von *Ampedus nigrinus* (Herbst). Der Pfeil zeigt die stark sklerotisierte radio-medial (r-m) crossvein.

Vestiture of the ventral parts of the body. Reitter (1895, 1911) described the body of *Ampedus auripes* as shining, completely covered with fine, black, slightly upstanding pubescence. Laibner (2000) likewise mentioned black pubescence, which may sometimes be brown ventrally.

Wurst & Kaupp (1995), according to their morphological investigations, regard the predominantly black pubescence of the venter as a character that is not very constant.

In the present study, we confirm that hardly any specimens were found to possess predominantly black pubescence on the underside. However, vestiture of the two species was nevertheless very different: whilst *Ampedus auripes* has mainly red-brown pubescence on the ventral part of body (Fig. 10), *A. nigrinus* is immediately recognizable by its dense, golden-yellow pubescence (Fig. 11). Because of its sparse pubescence, *A. auripes* appears shiny in comparison to *A. nigrinus* (Fig. 10).

As shown in Figs. 10 and 11, pubescence on the ventral part of the body can certainly be used for identification. (Specimens in alcohol should, however, be dried thoroughly before identification, so that the setae are well visible!)



Fig. 10. Underside of a male *Ampedus auripes* (Reitter); sparse red-brown, sometimes black body vestiture.
 Unterseite (ventral) eines Männchens von *Ampedus auripes* (Reitter); spärlich rötlich-braune, manchmal schwarze Behaarung der Körperunterseite



Fig. 11. Underside of a male *Ampedus nigrinus* (Herbst); dense golden-yellow body vestiture.
 Unterseite (ventral) eines Männchens von *Ampedus nigrinus* (Herbst); dichte gold-gelbe Behaarung der Körperunterseite

Pronotum. The shape of pronotum is one of the most important characters for the distinction of *Ampedus auripes* from *A. nigrinus*. Whilst that of the female of *A. nigrinus* is narrowing anteriorly at a acute angle (Fig. 13), that of the female of *A. auripes* is narrowing anteriorly at a obtuse angle, and is less broad than long (Fig. 12). This is also mentioned by Reitter (1895) in his original description.

All male specimens of *Ampedus auripes* exhibit a roughly trapezoid pronotum, narrowing in a straight line towards the front (Fig.14). The pronotum of *A. nigrinus* is narrowing towards the front, but with a curved outline (Fig.15). Wurst (1992), Wurst & Kaupp (1995) and Laibner (2000) also described this character as being different between the two species. The shape of the lateral edge of pronotum can be clearly observed from lateral view: whilst the lateral edge in the male of *A. auripes* runs straight along the underside (Fig. 16), it is arched in *A. nigrinus* (Fig. 17).

The flattened pronotum of *A. auripes*, as described by Laibner (2000), was also clearly observed in the specimens from the Bavarian Forest (Fig. 16). However, a direct comparison with *A. nigrinus* is necessary to appreciate this (Fig. 17).

The outline of the lateral edge of pronotum in the female does not show such clear differences between the species as in the males. In females of *Ampedus auripes* and *A. nigrinus* the edge is weakly curved (Fig. 18, 19). Identification of females using this character is therefore not recommended. On the other hand, females of *A. auripes* (Fig. 18) exhibit flattened pronotum, which is convex in *A. nigrinus* (Fig. 19).

Both sexes of *Ampedus auripes* show a more or less clearly visible median furrow on the basal part of pronotum, whilst *A. nigrinus* may sometimes have a shallow longitudinal impression on pronotum (Wurst & Kaupp 1995) (see also Fig. 13).

Shape of pronotum proved to be a quick and reliable identification character. In the possibly hybrid specimens, the shape of pronotum did not allow definite placement of the specimens (see results "Hybrid").



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Fig. 12. Dorsal view of pronotum of a female *Ampedus auripes* (Reitter). Pronotum is narrowing anteriorly at a slight angle.

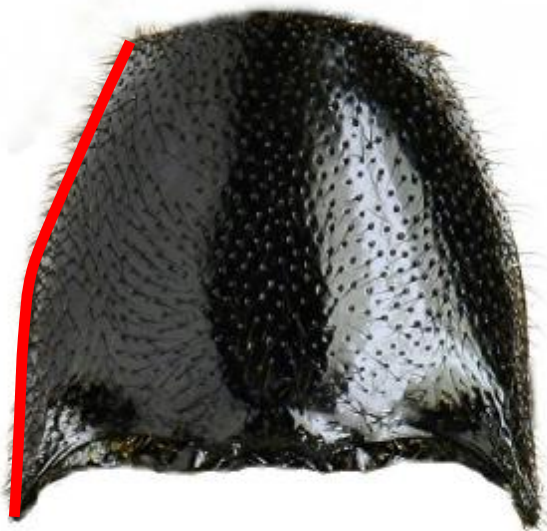
Aufsicht auf das Pronotum eines Weibchens von *Ampedus auripes* (Reitter). Verengung des Halsschildes nach vorn in einen schwachen Winkel.



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Fig. 13. Dorsal view of pronotum of a female *Ampedus nigrinus* (Herbst). Pronotum is narrowing anteriorly at a more produced angle.

Aufsicht auf das Pronotum eines Weibchens von *Ampedus nigrinus* (Herbst). Verengung des Halsschildes nach vorn in einen starken Winkel.



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Fig. 14. Dorsal view of the pronotum of a male *Ampedus auripes* (Reitter). Pronotum is narrowing anteriorly almost as a straight line.

Aufsicht auf das Pronotum eines Männchens von *Ampedus auripes* (Reitter). Verengung des Halsschildes nach vorn in eine fast gerade Linie.



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Fig. 15. Dorsal view of the pronotum of a male *Ampedus nigrinus* (Herbst). Pronotum is narrowing anteriorly as a continuously curved line.

Aufsicht auf das Pronotum eines Männchens von *Ampedus nigrinus* (Herbst). Halsschild nach vorn deutlich gerundet verengt.

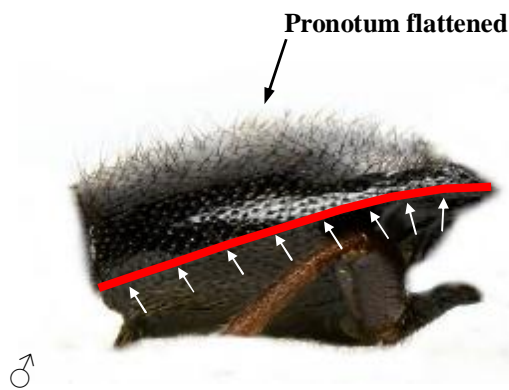


Fig. 16. Lateral view of pronotum of a male *Ampedus auripes* (Reitter). Lateral margin runs straight. Upper side of pronotum clearly flattened.

Seitenansicht des Pronotums eines Männchens von *Ampedus auripes* (Reitter). Halsschildseitenrand verläuft gerade nach unten. Halsschild auf der Oberseite deutlich abgeflacht.

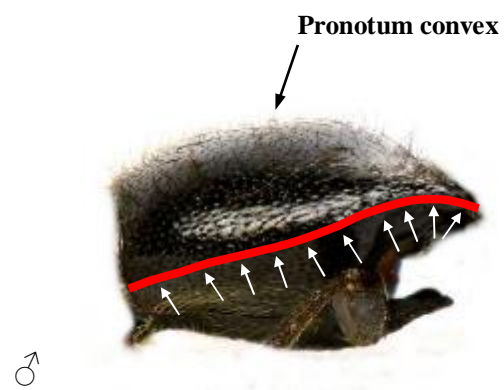


Fig. 17. Lateral view of pronotum of a male *Ampedus nigrinus* (Herbst). Lateral margin runs sinuately. Upper side of pronotum clearly convex.

Seitenansicht des Pronotums eines Männchens von *Ampedus nigrinus* (Herbst). Halsschildseitenrand verläuft gewölbt nach unten. Halsschild auf der Oberseite deutlich convex.

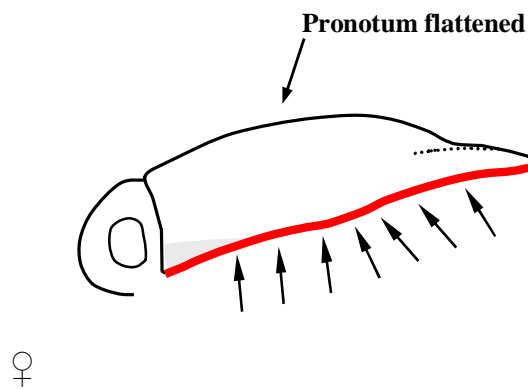


Fig. 18. Lateral view of pronotum of a female *Ampedus auripes* (Reitter). Lateral margin is slightly sinuate. Upper side of pronotum clearly flattened.

Seitenansicht des Pronotums eines Weibchens von *Ampedus auripes* (Reitter). Halsschildseitenrand ist schwach gewölbt. Halsschild auf der Oberseite deutlich abgeflacht.

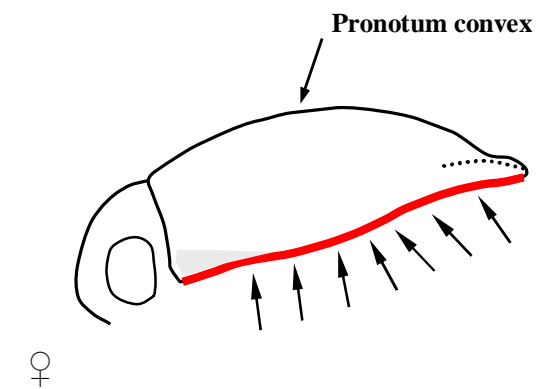
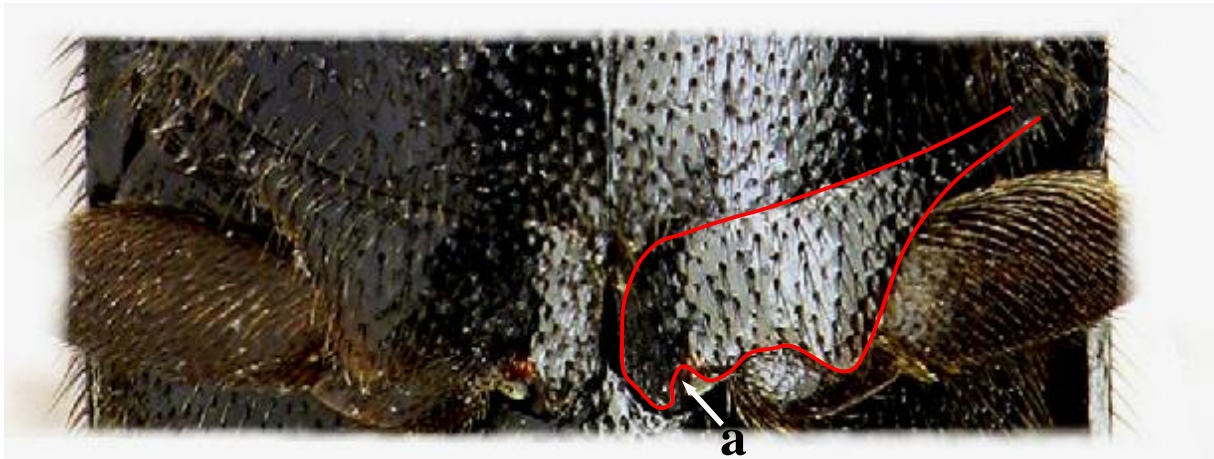


Fig. 19. Lateral view of pronotum of a female *Ampedus nigrinus* (Herbst). Lateral margin is slightly sinuate. Upper side of pronotum clearly convex.

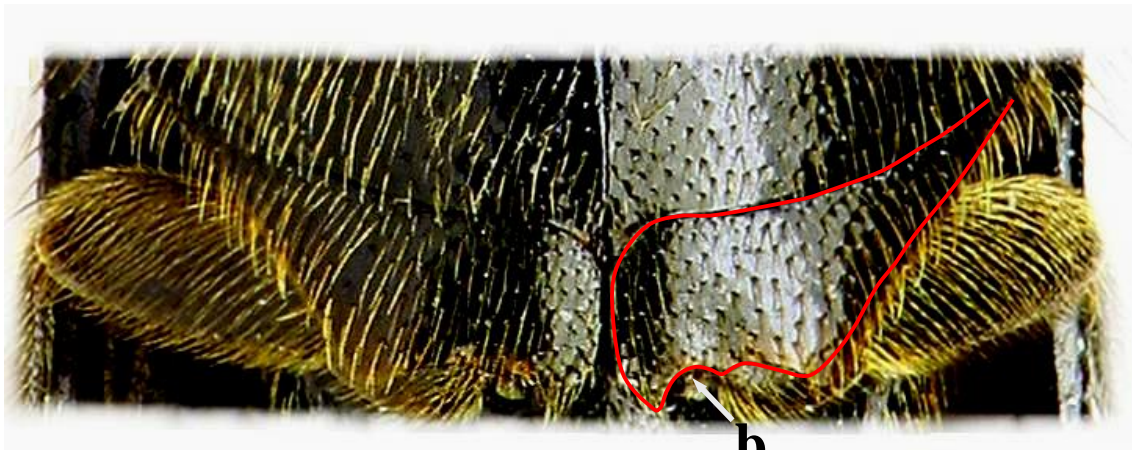
Seitenansicht des Pronotums eines Weibchens von *Ampedus nigrinus* (Herbst). Halsschildseitenrand ist schwach gewölbt. Halsschild auf der Oberseite deutlich convex.

The femoral plate. Wurst and Kaupp (1995) described the excised femoral plates of the hind legs of *Ampedus auripes* for the first time. This character has proved to be very helpful during the determination of more than 300 specimens. However, the development of this excision in the male is extremely variable. Some specimens possessed very deep, others more shallow excisions. Fig. 20 (a) shows a specimen with strongly excised femoral plates. In the female of *A. auripes*, the femoral plates are only weakly excised, and may thus be confused with the female of *A. nigrinus*. In the latter species the femoral plates may have entire margins (Wurst & Kaupp, 1995) or be slightly excised (Fig. 21 (b)).



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Fig. 20. Femoral plates of male *Ampedus auripes* (Reitter). a = ± deep excision of inner margin
Schenkeldecken eines Männchens von *Ampedus auripes* (Reitter). a = ± tiefer Einschnitt des Innenrands



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Fig. 21. Femoral plates of male *Ampedus nigrinus* (Herbst). a = excision of inner margin absent or very shallow
Schenkeldecken eines Männchens von *Ampedus nigrinus* (Herbst). b = kein bzw. flacher Einschnitt des Innenrands

“Hybrid” between *Ampedus auripes* (Reitter) and *Ampedus nigrinus* (Herbst)

As we already mentioned, we were not able to place 14 individuals as definitely belonging to one or the other of the two species using morphological characters. Study of their alae revealed that additional (“new”) fragments of veins were present in 11 of these specimens (Fig. 24-26, 28-30), which do not occur in the ground plan of the genus *Ampedus* Dejean, 1833 (Fig. 27). Reasons for this may be a modification (non hereditary change caused by external factors), or the activation of a basal (primitive) gene caused by the hybridization of the two species. Tarnawski (2000) outlined the phylogeny of Elateridae (Fig. 22), that implies the subfamily Elaterinae descended from the Cardiophorinae. Viewing the metathoracic wing of a “hybrid” (Fig. 24), a similarity with that of the genus *Cardiophorus* Eschscholtz, 1829 (Fig. 23) can be observed: the fork of A1 (anal vein) (Fig. 23) in *Cardiophorus* spec. is also weakly visible as in three “hybrid specimens” (Fig. 24, 25, 26).

Further investigation revealed an anteriorly shortened margin of the lateral pronotal edge in three individuals (Fig. 36), similar to that which can be found in Cardiophorinae. (Both sides of pronotum need to be inspected, since development may differ even between them.) One can thus postulate that plesiomorphic (primitive) characters are activated by the hybridization of the two species. This must, however, not necessarily result from hybridization. To verify the hypothesis, breeding experiments must be undertaken (*Ampedus auripes* female with *A. nigrinus* male and the reverse). Until then, the existence of “hybrids” remains only a conjecture.

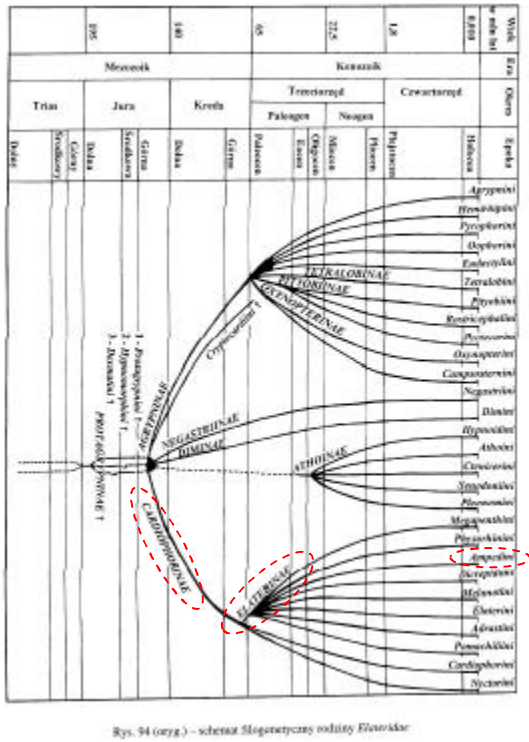


Fig. 22. Phylogeny of Elateridae (from Tarnawski, 2000).
Phylogenetisches System der Elateridae (aus Tarnawski, 2000).

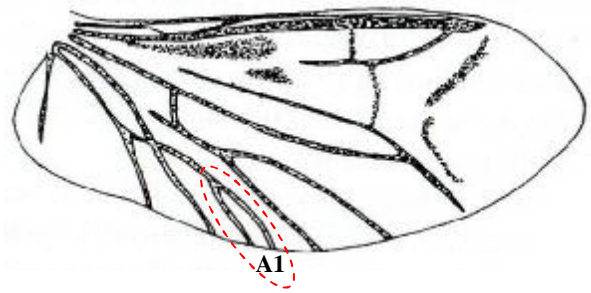


Fig. 23. Sketch of a metathoracic wing of the genus *Cardiophorus* Eschscholtz (from Tarnawski, 2000).
Skizzter Hautflügel der Gattung *Cardiophorus* Eschscholtz (aus Tarnawski, 2000).

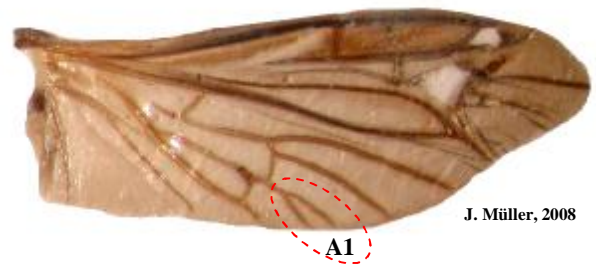


Fig. 24. Metathoracic wing (Example 1) of a "hybrid" with additional vein fragment on A1 (anal vein).
Hautflügel (Beispiel 1) eines „Hybriden“ mit einem zusätzlichen Aderfragment an der A1 (Analader).

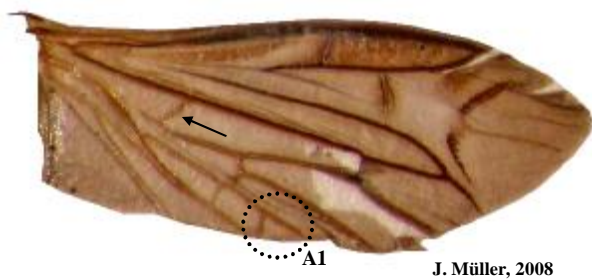


Fig. 25. Metathoracic wing (Example 2) of a "hybrid" with additional vein fragment on A1 (dotted circle); r-m crossvein strongly sclerotized (arrowed).
Hautflügel (Beispiel 2) eines „Hybriden“ mit einem zusätzlichen Aderfragment an der A1 (punktierter Kreis); r-m crossvein stark sklerotisiert (s. Pfeil).

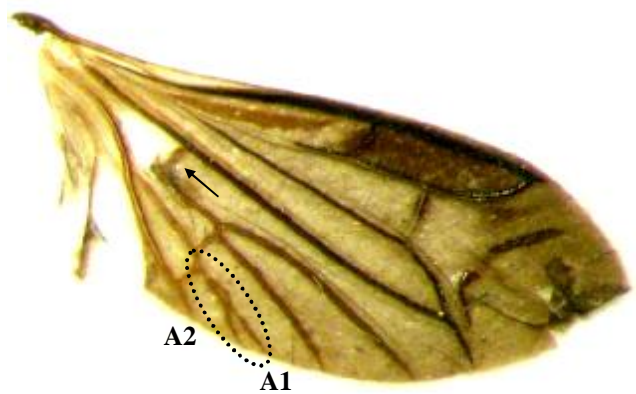


Fig. 26. Metathoracic wing (Example 3) of a „hybrid“ with additional vein fragment on A1 (dotted circle); r-m crossvein strongly sclerotized (arrowed).
Hautflügel (Beispiel 3) eines „Hybriden“ mit einem zusätzlichen Aderfragment an der A1 (punktierter Kreis); r-m crossvein stark sklerotisiert (s. Pfeil).

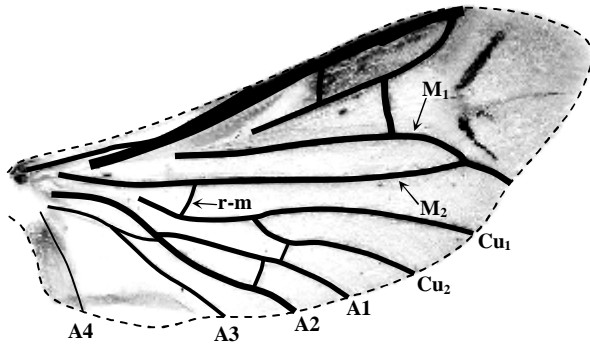


Fig. 27. Generalised venation of metathoracic wing of genus *Ampedus* Dejean (cantharoid type) (cf. Leseigneur, 1972).
 Schema der Aderung des Hautflügels der Gattung *Ampedus* Dejean (cantharoid type) (vgl. Leseigneur, 1972).

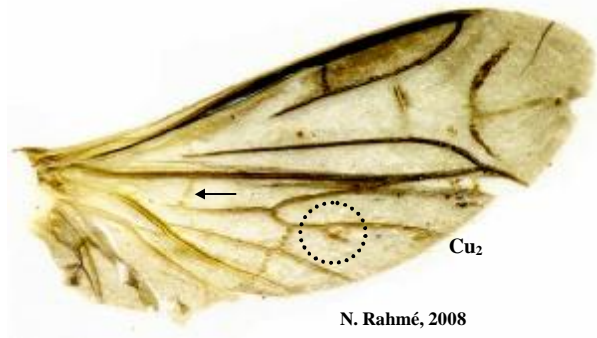


Fig. 28. Metathoracic wing (Example 4) of a „hybrid“ with an additional vein fragment on Cu₂ (cubitus) (dotted circle); r-m crossvein rather weakly sclerotized (arrowed).
 Hautflügel (Beispiel 4) eines „Hybriden“ mit einem zusätzlichen Aderfragment an der Cu₂ (Cubitus) (punktierter Kreis); r-m crossvein mäßig schwach sklerotisiert (s. Pfeil).

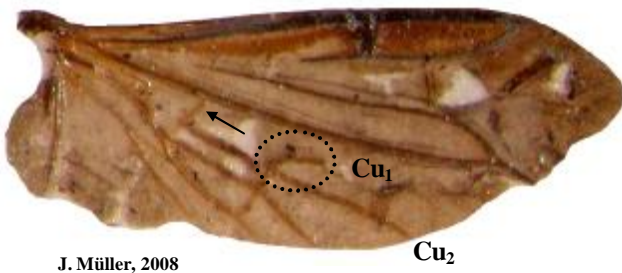


Fig. 29. Metathoracic wing (Example 5) of a “hybrid” with a shortened Cu₁ (dotted circle); r-m crossvein rather strongly sclerotized (arrowed).
 Hautflügel (Beispiel 5) eines „Hybriden“ mit einer verkürzten Cu₁ (punktierter Kreis); r-m crossvein mäßig stark sklerotisiert (s. Pfeil).

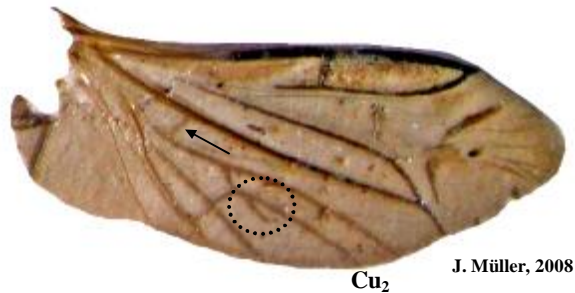


Fig. 30. Metathoracic wing (Example 6) of a “hybrid” with a shortened Cu₂ (dotted circle); r-m crossvein strongly sclerotized (arrowed).
 Hautflügel (Beispiel 6) eines „Hybriden“ mit einem zusätzlichen Aderfragment an der Cu₂ (punktierter Kreis); r-m crossvein stark sklerotisiert (s. Pfeil).

Morphological characters of the 14 “hybrid” specimens

Body size:

-male (n=10): 7.2-8.0 mm

-female (n=4): 7.9-9.2 mm)

Appearance (male). (Fig. 31)

- narrowing (Fig. 31 dashed line) of elytra begins shortly posterior of middle of elytra (dash-dotted line)

-elytral grooves rather strongly developed

-legs dark brown

Metathoracic wings. (Fig. 24-26, 28-30)

-additional fragments of veins (not always present)

-r-m crossvein strongly to rather weakly sclerotized

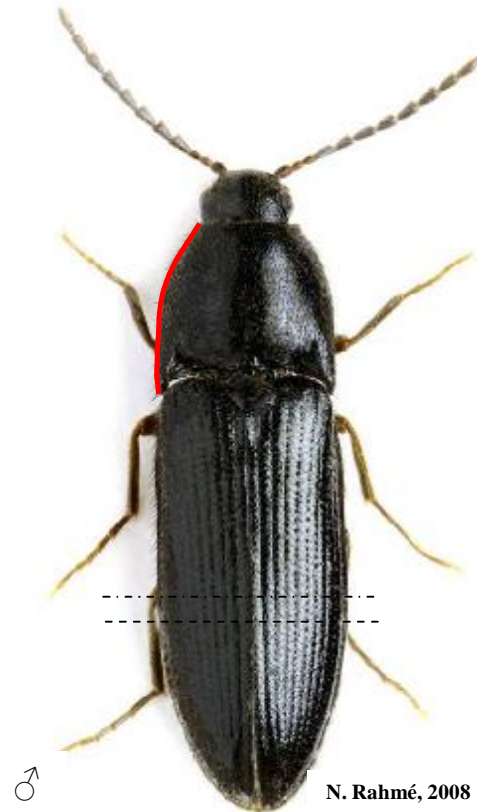


Fig. 31. Appearance of a male „hybrid“. The position of the lateral edge of pronotum marked by red line
Habitus eines männlichen „Hybriden“. Der Verlauf des Halsschildseitenrandes wird durch die rote Linie markiert.

Vestiture of the ventral side of the body. (Fig. 32)

-reddish-brown or yellowish-brown; relatively dense

-underside not as shining as in *Ampedus auripes*, rather dull (as in *A. nigrinus*)

-partly with long yellow setae scattered amongst other pubescence on upperside (similar to *A. nigrinus*)

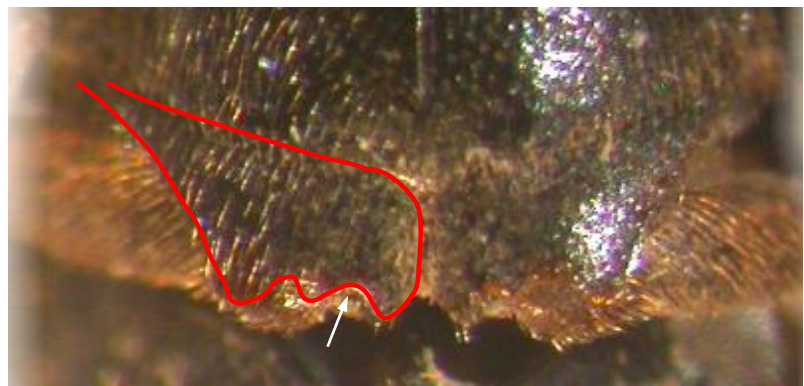


Fig. 32. Underside (ventral) of a male “hybrid”.
Unterseite (ventral) eines männlichen „Hybriden“.

Femoral plates. (Fig. 33)

-femoral plates (male) very deeply excised; as in *Ampedus auripes*

-female with femoral plates weakly excised



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Fig. 33. Femoral plates of a male „hybrid“.
Schenkeldecken eines männlichen „Hybriden“.

Pronotum. (Fig. 31, 34-36)

-from dorsal view in male “hybrids” narrowing with straight to weakly rounded outline (Fig. 31)

-lateral edge straight in males (sometimes very slightly arched) Fig. 34 (similar to *Ampedus auripes*)

-lateral edge more strongly arched in females Fig. 35 (similar to *A. nigrinus*)

-some specimens may display a shortened lateral margin anteriorly (Fig. 36)



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Fig. 34. Lateral view of pronotum of a male “hybrid”.
Seitenansicht des Halsschildes eines männlichen „Hybriden“.

Fig. 35. Lateral view of pronotum of a female “hybrid”.
Seitenansicht des Halsschildes eines weiblichen „Hybriden“.



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Fig. 36. Lateral view of pronotum of a male „hybrid“ with shortened lateral margin (arrowed)
Seitenansicht des Halsschildes eines männlichen „Hybriden“ mit verkürzter Seitenlinie (s. Pfeil)

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