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## Elucidating Article 45.6 of the International Code of Zoological Nomenclature: A dichotomous key for the determination of subspecific or infrasubspecific rank

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### Abstract

We present an overview of the difficulties sometimes encountered when determining whether a published name following a binomen is available or infrasubspecific and unavailable, following Article 45.6 of the International Code of Zoological Nomenclature (ICZN, 1999). We propose a dichotomous key that facilitates this determination and as a preferable method, given the convoluted and subordinate discussion, exceptions, and qualifications laid out in ICZN (1999: 49–50). Examples and citations are provided for each case one can encounter while making this assessment of availability status of names following the binomen.

**Key words:** available name, binomen, ICZN, subspecies, trinomen

### Introduction

The determination of whether a species-group name originally formed as a trinomen is infrasubspecific or subspecific can be difficult to make, particularly given the convoluted exceptions and qualifications one finds in Article 45.6 (ICZN, 1999: 49–50). However, this is very important since many of the seemingly valid names that are published are not available, according to the code. This is the most critical determination one must make as a first step to assessing the status of a name that follows a binomen. This problem became very evident as we were completing the database of the primary types of longhorned woodboring beetles (Coleoptera: Cerambycidae and Disteniidae) in the collection of the National Museum of Natural History, Smithsonian Institution (Lingafelter, et al., in prep.). We discovered that many of the “types”, although labeled and segregated by earlier researchers, did not, in fact, meet the status of availability as primary types since their trinomials were determined to be infrasubspecific.

When a fourth name follows a trinomen, that name is automatically infrasubspecific, according to Article 45.5 (aggregate or interpolated names excepted). However, when this is not the case, and one encounters a third name that follows a binomen, the provisions of Article 45.6 can make the determination more difficult. According to Article 45.6.2, “The rank denoted by a species-group name following a binomen is subspecific, except that it is deemed to be infrasubspecific if its author used one of the terms “aberration”, “ab.” or “morph”. Likewise, according to Article 45.6.3 “it is deemed to be infrasubspecific if it was first published after 1960 and the author expressly used one of the terms “variety” or “form” (including use of the terms “var.”, “forma”, “v.” and “f.”).

However, according to Article 45.6.4, a species-group name is considered “subspecific if first published before 1961 and its author expressly used one of the terms “variety” or “form” (including use of the terms “var.”, “forma”, “v.” and “f.”), *unless* its author also expressly gave it infrasubspecific rank, *or* the content of the work unambiguously reveals that the name was proposed for an infrasubspecific entity, in which case it is infrasubspecific”; *except* that according to Article 45.6.4.1, “a name that is infrasubspecific under Article 45.6.4 is nevertheless deemed to be subspecific from its original publication if, before 1985, it was either adopted as the valid name of a species or subspecies or was treated as a senior homonym.”

In summary, one can conclude that the terms “aberration”, “ab.” and “morph” *always* denote infrasubspecific status. The terms “variety” or “form” (including use of the terms “var.”, “forma”, “v.” and “f.”) only denote infrasubspecific

status if they are published *after* 1960. Before 1961, the terms "variety" or "form" (including use of the terms "var.", "forma", "v." and "f.") *only* denote infrasubspecific status *if* the author expressly gave it that status, based on 45.6.4.

We have determined that the complex language and subordinate exceptions and qualifications of Article 45.6 would be better handled as a dichotomous key where the user simply "keys out" their situation to facilitate the determination of subspecific or infrasubspecific status of names. Since the ICZN (1999) provides only a few examples for certain cases, and the determinations from some of these examples are suspect (e.g., see page 50), we provide examples and figures from the literature that show how actual cases are determined using this key.

### Key for determining subspecific or infrasubspecific rank of names following a binomen (ICZN Article 45.6)

- |  |  |
|--|--|
| 1a. Name includes the term "aberration", "ab.", "morph", or some modification of those words or abbreviations .....                        | Infrasubspecific (not available) [Example 1] |
| 1b. Name does not include the term "aberration", "ab.", "morph", or some modification of those words or abbreviations .....                | 2  |
| 2a. Name was published after 1960.....   | 3  |
| 2b. Name was published before 1961 .....   | 4  |
| 3a. Author expressly used one of the terms "variety" or "form" (including use of the terms "var.", "forma", "v." and "f.") .....           | Infrasubspecific (not available) [Example 2] |
| 3b. Author did not use one of the terms "variety" or "form" (including use of the terms "var.", "forma", "v." and "f.") ....               | Subspecific (available) [Example 3]          |
| 4a. Author expressly used one of the terms "variety" or "form" (including the terms "var.", "forma", "v." and "f.") .....                  | 5  |
| 4b. Author did not expressly use one of the terms "variety" or "form" (including use of the terms "var.", "forma", "v." and "f.").....     | 6  |
| 5a. Name was not expressly given infrasubspecific rank or the work did not indicate unambiguously that the name was infrasubspecific ..... | Subspecific (available) [Example 4]          |
| 5b. Name was expressly given infrasubspecific rank or the work indicates unambiguously that the name was infrasubspecific .....            | 6  |
| 6a. Name was not adopted as valid name of a species or subspecies or treated as a senior homonym before 1985 .....                         | Infrasubspecific (not available) [Example 5] |
| 6b. Name was adopted as valid name of a species or subspecies or treated as a senior homonym before 1985 .....                             | Subspecific (available) [Example 6]          |

### Discussion

The following examples from the literature demonstrate each possibility that is discussed in Article 45.6 and the key above.

Example 1. *Alphus senilis* ab. *uniformis* Tippmann, 1960: 165. In this example, Tippmann originally published the name with the abbreviation "ab. nov." (Fig. 1a). It is therefore automatically infrasubspecific and unavailable. The original use of "aberration" and "morph" or abbreviations of these terms is the simplest scenario for determination of availability of a name since the year of publication has no bearing on these cases. We have included a photo of the original specimen and labels (Fig. 1b, c) upon which this description is based to indicate how easy it is for one to mistakenly consider this a primary type.

Example 2. *Chariesthes subunicolor* var. *pictulus* Hunt & Breuning, 1966: 114. In this example, Hunt & Breuning (1966) expressly used "var." in their name (Fig. 2). Since it was published after 1960, it is infrasubspecific and unavailable, without further analysis.

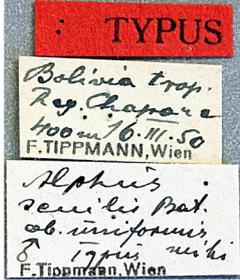
Example 3. *Oberea nigriceps* n. *obscuripennis* nov. Breuning, 1967: 40. In this example, Breuning includes explicitly described subspecies as well as "morphs." However, concerning "*obscuripennis*", the status intended by the author is unclear (Fig. 3). It could be argued that Breuning's use of "n." is a simple typographical error for "m."; however, because "n." is used elsewhere when referring to new taxa, it is ambiguous. Since this name was published after 1960 and does not include the term "aberration", "ab.", "morph", or some modification of those words or abbreviations and does not use one of the terms "variety" or "form" (including use of the terms "var.", "forma", "v." and "f."), it is deemed subspecific and available.

Example 4. *Trachyderes variegatus* var. *flavocinctus* Tippmann, 1953: 322. In this example (Fig. 4a), the name following the binomen was not expressly given infrasubspecific rank (for example, there was no usage of "subspecies" in

the text that would suggest the use of “variant” being infrasubspecific). Since the work did not indicate unambiguously that the name was infrasubspecific, it is deemed to be subspecific and available. Note that, although Tippmann used “ab.” on his labels (Fig. 4b), since he published this name using “var.” it is irrelevant.

Example 5. *Psenocerus supernotatus* var. *funebri* Casey, 1914: 367 (Fig. 5a). In this example, the author used “subspecies” for one taxon (for example, see Casey 1914: 360) (Fig. 5b) in addition to his usage of “variation” for another taxon in the same work. Therefore, his usage of “variant” is unambiguously infrasubspecific. Since it was not subsequently adopted as a valid name of a species or subspecies (or treated as a senior homonym) before 1985, it is deemed infrasubspecific and unavailable.

Example 6. *Fruticicola unidentata subsecta* Polinski, 1929: 167. The ICZN (1999: 50) provides this example for the situation where *Fruticicola unidentata subsecta* Polinski was proposed as a “variété (natio) n.” but since it was used as a subspecies in the book on gastropods and bivalves by Klemm (1954), it is deemed available.

<p><b><i>Alphus senilis</i> Bates ab. <i>uniformis</i> ab. nov.</b></p> <p>Typus: 1 ♂, Bolivia tropica, Région Chaparé, 400 m; 16.III.1950. R. Zischka leg.</p> <p>Paratypen: Eine Anzahl ♂♂ und ♀♀; Sotipo-Perú, 16. 3. 1939; Hansa Humboldt (jetzt Corupá), S. Catarina, Brasil, XI. 1935; Mafra. S. Catarina, Brasil, XI. 1935. Alle in meiner Sammlung.</p> <p><b>1a</b></p>	 <p><b>1b</b></p>	 <p><b>1c</b></p>
<p><b><i>C. subunicolor</i> var. <i>pictulus</i> var. nov.</b></p> <p>Like the nominate species <i>subunicolor</i>, but the clear reddish-brown colour deeper and formed into regular patterns; the pronotum has three rather irregular-shaped vittae, one median and one centrally situated on each side. There is a dark brown spot on the humeral angle, three irregularly shaped, transverse bands on the elytra, one post-basal, one more or less median and one post-median, there is also a dark reddish-brown spot on the apices of each elytron.</p> <p><i>Holotype</i>: Sabi Valley (S. Rhodesia), December 1942 (D. Townley).</p> <p><b>2</b></p>	<p><b><i>Oberea nigriceps</i> White n. <i>obscuripennis</i> nov.</b></p> <p>Comme <i>m. tibetana</i> Pic, mais avec les élytres de la coloration de la <i>m. changi</i> Gress.</p> <p>Type un ♂ du Tonkin: Monts Mauson, V-VI-, 700-1.000 m alt. leg. H. Fruhstorfer.</p> <p>Imprimerie de « L'Alsace », Mulhouse. - Dépôt légal No 1073, 3e trimestre 1967.</p> <p><b>3</b></p>	
<p>38. <b><i>T. variegatus</i> Pertx var. <i>flavocinctus</i> var. nov.:</b></p> <p>Kopf, Halsschild, Schildchen, sowie die beiden ersten Fuehlerglieder rotbraun. Schildchen mit einer apikalen Querfurche. Fluegeldeckenzeichnung der typischen Form von var. <i>audouini</i> Dup. (Abbildung 44 Est. XXIII Figs. 12 u. 13) entsprechend, aber am Rand von basalen ersten Drittel beginnend bis zur Spitze breiter gelb gesaumt. Skizzenblatt Fig. 12 und Abbildung 44 Est. XXIII Fig. 11.</p> <p><b>4a</b></p>	 <p><b>4b</b></p>	
<p>are in every way identical with the original type, showing that the nature of the latter is in no way aberrational. There is a blackish variety of the usually red-brown <i>supernotatus</i>, which may have been confounded with <i>tristis</i>, but it does not resemble it in any way. This black variety of <i>supernotatus</i> resembles the latter in general form, size and markings, but the antennæ are a little longer and thicker and the first joint is more developed; the basal prominence of the elytra is equally pronounced; this variety may be called <b><i>Psenocerus supernotatus</i> var. <i>funebri</i> n. var.</b>; it occurs abundantly</p> <p><b>5a</b></p>	<p><b><i>Chalcophora virginiensis</i> ssp. <i>antennalis</i> nov.</b>—Similar to <i>virginiensis</i> in general form, coloration and sculpture, but with a notably larger head and longer, more slender antennæ, which extend almost to the base of the prothorax, the latter similar in general form and with the sides obtusely and arcuately subprominent near apical third, but with the intricate sculpture toward the sides more broken; elytra similar but with the sides more rounded inward at base and the embossed smooth surfaces less elevated; sides distinctly serrulate apically; under surface nearly similar, except that the metasternum is more broadly concave. Length (♀) 29.0 mm.; width 10.0 mm. Idaho.</p> <p><b>5b</b></p>	

**FIGURES 1–5.** 1a, *Alphus senilis* ab. *uniformis*, excerpt from original description (yellow highlight added for emphasis); 1b, *A. senilis* ab. *uniformis*, specimen dorsal habitus; 1c, *A. senilis* ab. *uniformis*, specimen labels; 2, *Chariesthes subunicolor* var. *pictulus*, original description (yellow highlight added for emphasis); 3, *Oberea nigriceps* n. *obscuripennis* nov., original description (yellow highlight added for emphasis); 4a, *Trachyderes variegatus* var. *flavocinctus*, excerpt from original description (yellow highlight added for emphasis); 4b, *T. variegatus* var. *flavocinctus*, specimen labels; 5a, *Psenocerus supernotatus* var. *funebri*, excerpt from original description (yellow highlight added for emphasis); 5b, *Chalcophora virginiensis* ssp. *antennalis*, excerpt from original description (yellow highlight added for emphasis).

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