The group of *Cricula elaezia:* Comments on synonyms and priority questions, with illustrations of barcode similarity trees, distribution maps, a revised checklist and a formerly unknown female (Lepidoptera: Saturniidae)

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Abstract: The priority of two journal publication dates with partly overlapping contents and, as a result, several synonymies and a homonymy in the saturniid genera *Cricula* and *Coscinocera* is assessed; **Supplement 2** of "Neue Entomologische Nachrichten" and issue **3** (1) of "Entomo-Satsphingia" were published with about one week difference in publication date in favour of the first, in spite of an incorrect earlier date imprint on the title page of the latter. Synonymy questions were already solved elsewhere. Another paper aimed at "saving" the validity of the printed publication date (in fact, trying to explain that the same issue had been published twice: first as a "preprint" version on 9. I., then again in a corrected and enlarged form on 26. I. 2010), is based on a severe misinterpretation of the Code and is clearly entirely invalid. — The *elaezia*-group of the genus *Cricula* is revised; *Cricula pelengensis* U. & L. H. Paukstadt, 2009 (erroneous type locality; correct: Bali) and *Cricula baliensis* Naumann & Löffler, 2010 (t.l.: Bali) are **new synonyms** of *C. elaezia* Jordan, 1909, and treated as a subspecies from Bali: *C. elaezia pelengensis* U. & L. H. Paukstadt, 2009, **new status** as subspecies, and further *C. magnifenestrata elaeziopahangensis* Brechlin, 2010, **new status** as subspecies from West Malaysia. For other synonymies and changes, see the summary in the Checklist just before the Acknowledgements section. Two barcode similarity trees for the *elaezia*-group are published, as well as a distribution map of the entire group. The holotype female of *Cricula quinquefenestrata* Roepke, 1940 is illustrated in colour, as well as the formerly unknown female of *C. mindanaensis* Nässig & Treadaway, 1997.

Die Gruppe von *Cricula elaezia:* Anmerkungen zu Synonymien und Prioritätsfragen, mit Abbildungen von Barcode-Ähnlichkeitsbäumen, Verbreitungskarten, einer revidierten Checkliste sowie einem zuvor unbekannten Weibchen (Lepidoptera: Saturniidae)

Zusammenfassung: Prioritätsprobleme zweier Zeitschriftenpublikationen mit teilweise überlappendem Inhalt und daraus resultierenden Synonymien und einer Homonymie in den Saturniidengattungen *Cricula* und *Coscinocera* werden geklärt. **Supplement 2** der "Neuen Entomologischen Nachrichten" und Heft **3** (1) der "Entomo-Satsphingia" erschienen mit etwa einer Woche Unterschied, wobei das NEN-**Supplement 2** Priorität hat, trotz einer aufgedruckten fehlerhaften früheren Erscheinungsdatums des ESS-Hefts. Die Synonymiefragen wurden bereits anderswo publiziert. Eine weitere Publikation, die zum Ziel hatte, das aufgedruckte frühere Publikationsdatum zu „retten" (tatsächlich wurde ernsthaft die Hypothese aufgestellt, daß dasselbe Heft einer Zeitschrift zweimal publiziert sein sollte: zuerst als ein „Vorabdruck" am 9. I., dann ein zweites Mal in korrigierter und erweiterter Form am 26. I.), basiert auf einer fundamentalen Mißinterpretation des Codes und ist damit zweifelsfrei insgesamt invalide. — Die *elaezia*-Gruppe der Gattung *Cricula* wird revidiert; *Cricula pelengensis* U. & L. H. Paukstadt, 2009 (fehlerhafte Typuslokalität in der Urbeschreibung, richtig: Bali) und *Cricula baliensis* Naumann & Löffler, 2010 (t.l.: Bali) sind **neue Synonyme** von *C. elaezia* Jordan, 1909; das Taxon wird als eine Unterart von Bali interpretiert: *C. elaezia pelengensis* U. & L. H. Paukstadt, 2009, **neuer Status** als Subspezies, dazu *C. magnifenestrata elaeziopahangensis* Brechlin, 2010, **neuer Status** als Subspezies von West-Malaysia. Für andere Synonyme und Änderungen siehe die Zusammenfassung in der Checkliste am Ende. Zwei Barcode-Ähnlichkeitsbäume für die *elaezia*-Gruppe werden abgebildet, gleichfalls eine Verbreitungskarte der ganzen Gruppe. Der weibliche Holotypus von *Cricula quinquefenestrata* Roepke, 1940 wird farbig abgebildet, dazu das vorher unbekannte Weibchen von *C. mindanaensis* Nässig & Treadaway, 1997.

Introduction

(by Wolfgang A. Nässig, Ian J. Kitching & Richard S. Peigler)

Publications in entomological journals are usually intended to describe and interpret observed facts or experiments. However, sometimes it may also be necessary to comment on unusual cases that arise regarding human interactions in science.

Competition, sometimes even hard competition, is — at least to some degree — welcome, e.g., in economics, where it surely has its value and many advantages within this field of human activity. Politicians also try to implement this principle within science. There, though, it is rather problematic; in general, critical cooperation is surely the better way in science, because blind competition alone often leads to nonsense. In 2010, competition, and definitely a certain lack of communication and cooperation, led to some unnecessary redescriptions (and thus synonymies and even a homonymy) in Saturniidae, in the genera *Cricula* Walker, 1855 and *Coscinocera* Butler, 1879.

In recent years, several entomologists, including amateurs, began to submit legs of Saturniidae to the Barcode of Life laboratory in Guelph, Canada (see Ratnasingham & Hebert 2007; in the web: Barcode of Life [Bold]

[1] 76th contribution to the knowledge of the Saturniidae. (75th contribution: Naumann, S., & Nässig, W. A. (2010): Two species in *Saturnia (Rinaca) zuleika* Hope, 1843 (Lepidoptera: Saturniidae). — Nachrichten des Entomologischen Vereins Apollo, Frankfurt am Main, N.F. **31** (3): 127–143.)

2010), to obtain "barcode" data of the mitochondrial DNA of the cytochrome-*c* oxidase, subunit I, gene (COI). This was intended initially as a method for searching for cryptic species not easily identifiable by morphological methods (e.g., Decaëns & Rougerie 2008 in Saturniidae: Hemileucinae or Vaglia et al. 2008 in Sphingidae, and many others). Now, however, as the results have become widely available, every amateur entomologist involved seems keen to publish his preliminary results as soon as possible so as to have as many as possible of the new names with his – and *only* his! – authorship. When this is combined further with chaotic publication practices by the publishers of one of the private journals concerned, and then an external "volunteer helper" joined in an inappropiate interpretation of the rules of the Zoological Code of Nomenclature (ICZN 1999), the situation became even worse. The history and consequences of this case are described and commented upon below.

In the second part, some additions and revisional comments on species of the *elaezia*-group of the genus *Cricula* are provided.

Comments on the nomenclatural problems

(by Wolfgang A. Nässig, Ian J. Kitching & Richard S. Peigler)

How to produce synonyms and a homonymy

In the course of this competition to describe new taxa, several synonyms and a primary homonymy in Saturniidae were produced in early 2010. **Supplement 2** of the journal series "Neue Entomologische Nachrichten" ("NEN") and issue **3** (1) of the journal "Entomo-Satsphingia" ("ESS") were published with about one week difference in publication date (for details, see below). As there was some overlap of the taxonomic content in these two issues, this resulted in the synonymies and a primary homonymy. (As the different authors concerned had received their material from similar areas, and often from the same sources, *this* might have been expected.) Most of these synonyms were described in the genus *Cricula*.

The genus *Cricula* was established by Walker (1855: 1158 [key], 1186; see Fletcher & Nye 1982: 46 for further details); its type species (by monotypy) being *Saturnia trifenestrata* Helfer, 1837. Revisions of the genus were provided by Jordan (1909, 1939), Roepke (1940), Holloway (1981), and more recently by Nässig (1989a, excluding the species of the separate genus *Solus* Watson, 1913, see Nässig 1989b; 1995). The number of known and accepted species in *Cricula* has always increased during that time: Jordan (1909), Seitz (1926) and Bouvier (1936) included only 2 species (excluding *Solus drepanoides* (Moore, 1865)); Jordan (1939) increased the number by one species and several subspecies; Nässig (1989) listed 12 species in four groups and subgroups; and Nässig (1995) considered *Cricula* to contain 14 species in five species-groups. More recent publications (U. Paukstadt & Suhardjono 1992, Nässig & Treadaway 1997, Naumann & U. Paukstadt 1997, U. & L. H. Paukstadt 1998, 2001, 2009b, U. Paukstadt et al. 1998, Nässig et al. 1999, Brechlin 2001, 2004, 2010b, Naumann & Löffler 2010a, Naumann & Lane 2010) added further new taxa or elevated the status of previously described ones, so that at present there are about 30 species, some with several subspecies, recognized in the genus, the majority of which are certainly justified.

Over the years, these different taxa were not always described and handled with the same intensity of previous research; morphology alone – including that of the genitalia! – apparently was not always reliable *ad hoc* to distinguish species in this genus (in contrast to earlier expectations, e.g., Nässig & Treadaway 1997: 346), and often the status of ♀♀ (i.e., which belong to which species?) remained to be clarified by rearing or biochemical methods such as, e.g., DNA barcoding. So a gradually developing frustration forced the first author (W.A.N.) into new work on *Cricula,* based mainly on DNA data.

In recent years, studies by W.A.N. on *Cricula* were focused on the *elaezia* and *luzonica* species-groups. So in late summer 2009, he started preparing a treatise on the *elaezia*-group. On the occasion of the International Insect Exchange Fair in Frankfurt in early November 2009, he met Stefan Naumann (S.N.) who was, as already he knew, also working on the genus; not only on the *elaezia*-group, but also on other species-groups. It was agreed that S.N. and W.A.N. would co-author on the *elaezia*-group, while S.N. would publish his results on other species separately (in coauthorship with Swen Löffler). (Ron Brechlin [R.B.] and Ulrich Paukstadt [U.P.] were not in Frankfurt at that time, and neither one of the two in Frankfurt knew of their publication plans.) The manuscript on the *elaezia*-group was planned to go to print in early 2010, with the possibility that it might be delayed until mid-2010 (there were still ♀♀ barcodes lacking to correctly associate them with their conspecific ♂♂).

On Saturday 9. i. 2010, R.B. sent a request to Frankfurt regarding possible paratypes (PTs) in the Senckenberg collection, Frankfurt am Main, of a number of new taxa he intended to describe in several different genera (this email was read only on Monday, 11. i., after the weekend). After reading his list, W.A.N. informed him of the plans regarding the *elaezia*-group of *Cricula* and offered either coauthorship on the group or, alternatively, that this group would be published by S.N. and W.A.N., with R.B.'s PTs. However, it soon became clear that R.B. was not interested in such a collaboration, and insisted on publishing all his manuscripts on his own in the first issue of "ESS" of 2010. This could be produced well before the Apollo editors could be expected to publish the next issue of the series "Nachrichten des Entomologischen Vereins Apollo" ("NEVA"), which passes through the conventional process of a commercial printing office, in contrast to "ESS", which is printed on a private laser printer in the house of R.B.'s co-publisher Frank Meister (F.M.) (and such "printing races" are in any case not a

good idea, as demonstrated here). Also, some additional barcoding results from Canada regarding the identity of some ♀♀ found in Sundaland had still not been received.

So, it was with some reluctance and considerable frustration, because at that time the unfinished manuscript on the *elaezia*-group already comprised some 20 manuscript pages, several illustrations and over three months work, that W.A.N. called a halt to his work and informed S.N. that the collaboration on the *elaezia*-group had to be cancelled. Type material data from Frankfurt was then delivered genus by genus to R.B. S.N., of course, continued with his intention to publish his own contributions on *Cricula* (on which he had also spent months of work at that time and earlier had invited Swen Löffler to join him as coauthor). He then added the section on the *elaezia*-group back into his manuscript, without informing Frankfurt, and, in the rush to publish, used an older text version, which regrettably lacked the PT data from the Frankfurt material. He then submitted this manuscript to the "Neue Entomologische Nachrichten" ("NEN") of U. Eitschberger, who rapidly published it as **Supplement 2** of that journal.

The overlap in described species in these two papers relating to *Cricula* and *Coscinocera* means that it is essential to determine both their publication status and dates of publication, so that the Principle of Priority can be correctly applied when the relevant synonymies are worked out. The first and primary step is to confirm whether or not the papers published in "ESS" **3** (1) fulfill the requirements of being published for the purposes of zoological nomenclature.

Assessing the real publication dates

The real publication dates of both papers were assessed as follows (in accordance with the provisions of the Code, ICZN 1999: Art. 21; see the next section for the issue involving the special provisions of Art. 21.8):

- The date printed on the cover of S.N.'s publications in "NEN" **Suppl. 2** is "18. Januar 2010", printing and binding taking place on 18.–19. i. (U. Eitschberger, S. Naumann, pers. comm). S.N. received his copy by mail (as a letter) on 20. i., and the Supplement had already been posted to a few libraries on 19./20. i., and to subscribers a little later; the personal subscriber's copies of both publications, "NEN" **Suppl. 2** as well as "ESS" **3** (1) (see below), were received by W.A.N. on the same day by normal mail: January 27th. The date of receipt of "NEN" **Suppl. 2** at the two institutions of the Deutsche Nationalbibliothek in Frankfurt am Main and Leipzig, where copies of all printed publications in Germany must be automatically submitted by their publishers, was also researched. It is stamped "February 15th", which suggests that it was sent only when the next scheduled issue of "NEN" was published. However, we have no reason to doubt that copies were generally available from **January 19th, 2010.**

Note. The cover of "NEN" **Suppl. 2** actually says "Supplement 1", though it correctly says "Supplement 2" in the running heads on the internal pages. Evidently the publisher of "NEN" was in a hurry to get this publication out and overlooked this minor detail.

- The date printed on the front cover and title page of "ESS" **3** (1) (i.e., 9. i. 2010) cannot be correct, because this was the date when R.B. asked for PT data from Frankfurt (see above) with the promise to include them in the papers. These were collated genus by genus and finally sent on the evening of 19. i. 2010, see next paragraph. Therefore, Art. 21.4 of the Code applies.
- Although R.B., in an e-mail to Frankfurt of 9. ii. 2010, stated that the real printing date had been 15./16. i. 2010, this is also obviously incorrect (Art. 21.4) because PT data that were sent to him via email on the evening of 19. i. were included in the final version, although further PT data and some corrections, which were emailed on 22. i., were not (although R.B. confirmed receipt of this latter mail and wrote that these data would also be included). So the *earliest possible printing date* for the final version of "ESS" **3** (1), as assessed in Frankfurt, was 20. i. 2010, and the latest 26. i., because this is the date of the postmark on the envelope of the copy received in Frankfurt (the Frankfurt PT data of 22. i. having been lost somewhere and some time in between).
- R.B. sends his manuscripts to the second author (I.J.K.) for checking of linguistic and other issues, in addition to requests for possible PT data. The final edit made by I.J.K. of the *Cricula* manuscript ("Cricula elaezia(IJKedits).doc"), with PT data from the Natural History Museum, London (BMNH) added, was made at his home on Sunday 24. i. 2010 and the file save was timed as 15:38. This file, which has been archived at the BMNH, was then sent to R.B. shortly afterwards and he would probably have received it some time after 16:45 Central European Time. Consequently, the earliest that "ESS" **3** (1) could have been mailed would have been the morning of Monday 25. i. However, as with W.A.N.'s copy, the postmark on the envelope containing I.J.K.'s copy also appears to be 26. i. (although this is not absolutely certain as the postmark is somewhat smudged). I.J.K.'s copy arrived rather later, on 1. ii. 2010. Some weeks later, R.B. informed I.J.K. in an email that "ESS" **3** (1) was printed on 25 i., so mailing could have been either later that day or the next.

As there simply cannot be different printing dates for one single issue of a periodical (journal), and because the Code requires that there cannot be any changes to published versions of valid publications (see next chapter), the only correct publication date is that day on which the **completed and final issue** was printed and sent out to the subscribers and libraries.

- The most benevolent interpretation for the publication date of "9. i. 2010" printed on the cover and title page of "ESS" vol. **3** (1) (i.e., much earlier than the actual printing date) is that it was a lapsus in internal

communication between F.M. and his co-publisher, R.B., that was not subsequently corrected. According to correspondence with R.B., F.M. originally intended to go to print on this date (and had already produced the cover pages and also a few copies of the preliminary, unfinished text of the various manuscripts with this in mind). However, R.B. stopped the process on the weekend of 9./10. I. to include some further corrections and PT data (R. Brechlin, pers. comm.). Unfortunately, when the final version was printed on 25. I., the date printed on the cover was not changed.

- The date of receipt of the final version of "ESS" **3** (1) at the two institutions of the Deutsche Nationalbibliothek in Frankfurt am Main and Leipzig was found to be 27. I. 2010, the same date as the W.A.N. copy. Some of the pages that were changed during January have also been checked; they appear to be identical in both Frankfurt copies; so the copy in the German National Library apparently is the final copy. No additional copy of any "first version" (see also below) has been received and deposited there.

Thus, the correct date of printing of "ESS" **3** (1) would appear to be 25. I. 2010, with dispatch either the same day or, more likely, the following day, 26. I. 2010. According to Art. 21.3.1 of the Code, the publication date must be interpreted to be the ***last*** day of such a span, which means that the correct publication date in accordance with the Code must be taken to be **January 26th, 2010.**

Note: There is another incorrect publication date printed within "ESS" **3** (1): On the title page of the paper by Brechlin & Meister (2010), the date in the running header above the title erroneously reads, "October 2010" [i.e., October 31st, 2010]. Nevertheless, like all other papers in this issue of "ESS", this paper was published on January 26th, 2010. (Of course, these running headers on the first page of each article do not provide any evidence to help ascertain the real publication date because they state only the month "January 2010" – which would have to be taken to be January 31st, 2010 when applying Art. 21.3.1 of the Code.)

A subsequent interpretation by U. Paukstadt: preprint or proof copy (if even published at all)?

And that should have been that; the papers published in "NEN" **Suppl. 2** clearly have a week's priority over those published in "ESS" **3** (1). However, several copies of the first uncorrected and unfinished version were subsequently sent out by F.M., one to U.P. (who also coauthored a paper in the issue: Brechlin & Paukstadt 2010), and this led to a further paper (U. & L. H. Paukstadt 2010b), published on 30. III. 2010, in which U.P. proposed a rather strange interpretation of the situation aimed at "saving" the validity of the "first version" of "ESS" **3** (1) and its printed publication date of 9. I. 2010. We do not know when, and to whom, copies of this "first version" were mailed; two requested copies for I.J.K. and the BMNH were only received in London long after the final version was issued.

According to Paukstadt's interpretation, the early version of "ESS" **3** (1) sent to him by F.M. possibly before January 26th (Paukstadt did not state his date of receipt – did he really receive it before 26. I.?) should be interpreted as a "preprint" with a valid separate publication date (Paukstadt assumed 9. I.) according to Art. 21.8 of the Code (ICZN 1999). In fact, U. & L. H. Paukstadt (2010b) seriously tried to explain that the same issue "ESS" **3** (1) *had been published* ***twice:*** first as a "preprint" version on 9. I., then again in a corrected and enlarged form on 26. I., and that as a result the changes and additions (particularly of PTs) in the second version were not valid with regard to zoological nomenclature.

This is a fundamental misinterpretation of the provisions of the Code.

Art. 21.8 reads:

> *[Italics and* ***bold Italics*** *have been added to highlight the most important wording of the Code with respect to the present case.]*
>
> **Article 21.8. Advance distribution of separates and preprints.** Before 2000, an author who distributed separates in advance of the specified date of publication of the work in which the material is published thereby advanced the date of publication. The advance issue of separates after 1999 does not do so, whereas *preprints, clearly imprinted with their own date of publication,* may be published works from the date of their issue (see Glossary: "separate", "preprint").

In the Glossary, we find:

preprint, ***n.***

- A work ***published,*** with its *own specified date of publication* (imprint date), in advance of its later ***reissue*** *as part of a collective or cumulative work*. Preprints may be published works for the purposes of zoological nomenclature. See separate.

separate, ***n.***

- A copy (reprint or offprint) of a work contained in a periodical, book or other larger work, intended for distribution (usually privately by the author(s)) detached from the larger work which contains it but without its own specified date of publication (imprint date). The advance distribution of separates after 1999 does not constitute publication for purposes of zoological nomenclature. See preprint.

Obviously, U.P. had not read the Glossary of the Code, because:

- The journal "ESS" is in no way a "*collective or cumulative work*". It is just a normal periodical, publishing several bound issues per year, which together form annual volumes. This mode of publication does not permit his interpretation of "preprints".
- A bound issue of a periodical cannot be published in parts (or in different versions), and the separate papers within that issue do not carry separate publication dates. The issue is the smallest unit of the journal; separate copies of single papers from this issue have never been sent in advance to the public or to libraries.
- A preprint is not "***reissued***" (as required by the Code) if there have been changes to it. The changes undertaken to the contents of the "first version" preclude, in connection with Art. 8 (see below), any interpretation as "preprints".

So the "first version" of "ESS" **3** (1) received by U.P., possibly before January 26th, 2010, is neither a preprint nor a separate, as defined by the Code (further copies of this "first version" were only mailed out over a month after the final version was published, which thus adds another element to the confusion).

The only possible interpretation of the status of the "first version" that can be determined is that it may have been some strange sort of a proof copy – and this again is a rather benevolent interpretation of the confusion produced by the publishers of "ESS". Proof copies are never published (see below) because – by definition – there will be changes and corrections (and here also additions) to the text. Furthermore, they are not available to the public, but only to the authors.

The next erroneous interpretation by U. & L. H. Paukstadt (2010b) concerns the circumstances that are necessary to qualify a **publication** for validity under the Code of Zoological Nomenclature. Art. 8 of the Code states:

Article 8. What constitutes published work. A work is to be regarded as published for the purposes of zoological nomenclature if it complies with the requirements of this Article and is not excluded by the provisions of Article 9.

- **8.1. Criteria to be met.** A work must satisfy the following criteria:
- **8.1.1.** it must be issued for the purpose of providing *a **public** and **permanent** scientific record,*
- **8.1.2.** it must be *obtainable,* when first issued, free of charge or by purchase, and
- **8.1.3.** it must have been produced in an edition containing ***simultaneously** obtainable copies* by a method that *assures numerous **identical** and durable copies.*

According to ICZN (1999: Art. 8.1; see also Art. 11), any early distribution of "ESS" **3** (1) before 26. I. 2010 does not constitute valid publication, and thus any nomenclatural acts contained within it are not available, because:

- Copies of the "first version" were not available to the public – they were only sent to a coauthor and maybe a few further selected people – and so did not provide the necessary qualifications of Art. 8.1.1 and 8.1.2.
- They were not sent out in their final version (the final version contains corrections that were sent to R.B. in his role as author and as publisher as late as 24. I.), so they did not provide the permanent scientific record of Art. 8.1.1.
- The publishers did not assure the ***simultaneously** obtainable numerous **identical*** copies required by Art. 8.1.3.
- Furthermore, no copy of that "first version" was deposited at that time in any public library. Enquiries were made to the Deutsche Nationalbibliothek in Frankfurt am Main and Leipzig, but both replied (on 17. IX. 2010) that they did not have a copy of the "first version" of "ESS" **3** (1).
- Neither in the first nor later dispatches were a separate status (as a "preprint") and separate dates for each paper of the "first version" explicitly declared; the distribution of copies of the "first version" of the issue was just incidental and uncoordinated.

This question of valid publication is the most critical; it is not acceptable under the Code to publish journal issues containing valid contributions to zoological nomenclature (including descriptions of new taxa and PT data) ***in differing versions at different dates and with altered contents*** – this would open the door widely to all sorts of cheating and deceit, including changing publication dates and adding further type material after initial publication. In the Preamble, the Code explains why this is so important: "*The objects of the Code are to promote stability and universality in the scientific names of animals and to ensure that the name of each taxon is unique and distinct. All its provisions and recommendations are subservient to those ends ...*"

To summarize: all U.P.'s interpretations (U. & L. H. Paukstadt 2010b, 2010d) concerning the nomenclatural validity of an early distribution of a "first version" of "ESS" **3** (1) from Prenzlau (where F.M. lives) based on Art. 21.8 make no sense and are clearly invalid.

F.M.'s early sending of the "first version" can really be interpreted only (and then benevolently) as a sort of somewhat confused proof dispatch.

A stricter interpretation of the Code (from a less benevolent viewpoint and arguing simply from the basis of U. & L. H. Paukstadt's interpretation that there *are* two different published versions) could imply that the entire issue "ESS" **3** (1), both versions, was not validly published at all. When Art. 8 of the Code is not fulfilled by a publication, because there are two or more different versions of it in existence, the publication is consequently considered to be invalid for the purposes of zoological nomenclature. We do not imagine that authors and publishers of "ESS" would welcome that outcome.

However, in any case, only the printing and mailing of the ***final*** version (the contents of which have not been modified in any respect subsequently) of an issue of a journal to ***all*** subscribers and libraries can be accepted as providing the correct publication date and nomenclatural validity (ICZN 1999: Art. 8.1, especially 8.1.3; see also Art. 9.7).

The result: many synonymies and a primary homonymy

The resulting seven subjective synonymies (based both on priority and the "Principle of the First Reviser", Art. 24.2) within the genus *Cricula* (Naumann & Löffler 2010a, Brechlin 2010b) and the primary homonymy and synonymy within the genus *Coscinocera* (Naumann & Löffler 2010b, Brechlin 2010a) have already been published by Naumann (2010). All the contrary taxonomic and nomenclatural changes suggested by U. & L. H. Paukstadt (2010b and 2010d) based on their erroneous "preprint hypothesis" are simply invalid, because they were not based on the provisions of the Code. The syn-

onymies published by Naumann (2010) remain valid; certainly Art. 24.2.5 of the Code cannot be validly invoked, as suggested by U. & L. H. Paukstadt (2010b: 60). It is not necessary to explicitly propose revised synonymies for each taxon here, because the changes by U. & L. H. Paukstadt (2010b, c) were never valid and so did not formally affect the nomenclatural acts of Naumann (2010).

Back to the *elaezia*-group and research

(by Wolfgang A. Nässig)

Abbreviations and conventions see in Naumann & Nässig (2010). Additions:

CRBP Collection Ron Brechlin, Pasewalk, Germany.

CUPW Collection Ulrich Paukstadt, Wilhelmhaven, Germany.

MZB Museum Zoologicum Bogoriense (Cibinong, Bogor, West Java, Indonesia).

RMNH formerly Rijksmuseum van Natuurlijke Historie, now name changed to Netherlands Centre for Biodiversity Naturalis, Leiden, Netherlands.

The *elaezia*-group: what is it?

The present publication deals mainly with the *elaezia* species-group of the genus *Cricula*. This group was defined by Nässig (1989a and — in a slightly modified way — 1995) on basis of morphological characters, especially in ♂ genitalia: sella (terminology following Roepke 1940: this is a large sclerotised extension of — most likely — the juxta caudo-ventral of the phallus supporting it, specifically found in the genus *Cricula*) at its distal end bifid, but not deeply split and tips not widely apart; harpe (i.e. the tip of the ventral part of the valves [= sacculus]; cuiller sensu Lemaire 1978; clasper according to some other authors) large, broad and prominent, spoon-like; vesica simple, without sclerites, scobination and cornuti. The species forming the *elaezia*-group were, according to Nässig (1995), *C. elaezia* Jordan, 1909 from Sundaland, *C. quinquefenestrata* Roepke, 1940 from Sulawesi and *C.* "spec. nov. 1" from Mindanao (Philippines), which was soon later described by Nässig & Treadaway (1997) as *Cricula mindanaensis*. A fourth species of the group, *C. palawanica,* was then added by Brechlin (2001) from Palawan. The taxon *C. pelengensis* U. & L. H. Paukstadt, 2009 has a somewhat dubious origin and status; see the systematic section below.

On the basis of ♂ genitalia morphology (especially: sella deeply bifid over more than 50% of its length, with the tips extremely wide apart; vesica with small sclerites) and external habitus, *Cricula sumatrensis* Jordan, 1939 was placed by Nässig (1989a, 1995) into the *andrei* species-group. However, as a result of the DNA barcoding analyses it was found that *C. sumatrensis* clearly does not belong to the *andrei*-group, but appears to be another member of the *elaezia*-group (published by Naumann & Löffler 2010a: 11); see Figs. 1 & 2. U. & L. H. Paukstadt (2010a: 8) also stated they studied barcode data of *C. sumatrensis,* but evidently did not barcode sufficient other material to reach the same result (no details of the barcode numbers were provided and the results are not publicly available).

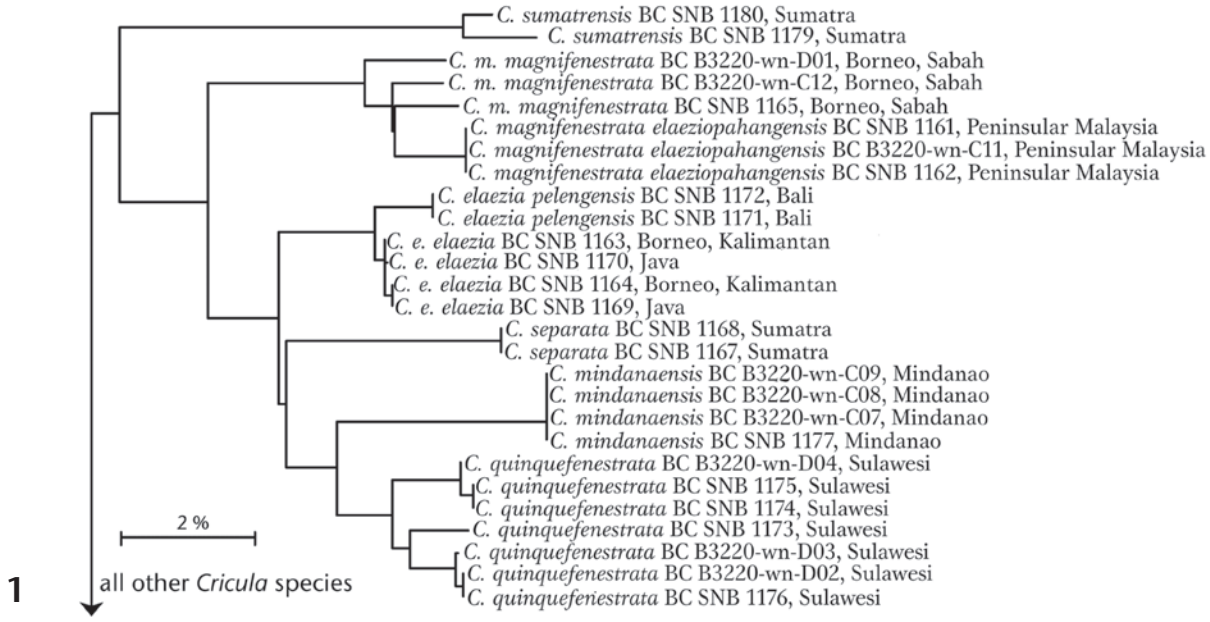
However, the suggestion by U. & L. H. Paukstadt (2004: 185) that *Cricula hayatiae* Paukstadt & Suhardjono, 1992 also may belong to the *elaezia* species-group was not supported by DNA barcode studies (Naumann & Löffler 2010a: 11, Naumann & Lane 2010: 17); in contrast, *C. hayatiae* appears to be part of the basal sister taxon within the *luzonica* species-group. [History: *C. hayatiae* was originally described in the *andrei*-group (*sensu* Nässig 1989a) based on the bifid sella; later it was tentatively placed into the *trifenestrata*-group (Nässig 1995) based on larval (see U. & L. H. Paukstadt 1993) and general genitalia morphology.] The comments of U. & L. H. Paukstadt (2010b: 61) on a possible re-inclusion of *hayatiae* into the *trifenestrata*-group are speculative and inadequate, because the authors have not yet seen the new taxa of the *luzonica*-group, especially those from the Philippines, on which we shall publish soon (Nässig & Treadaway, in prep.).

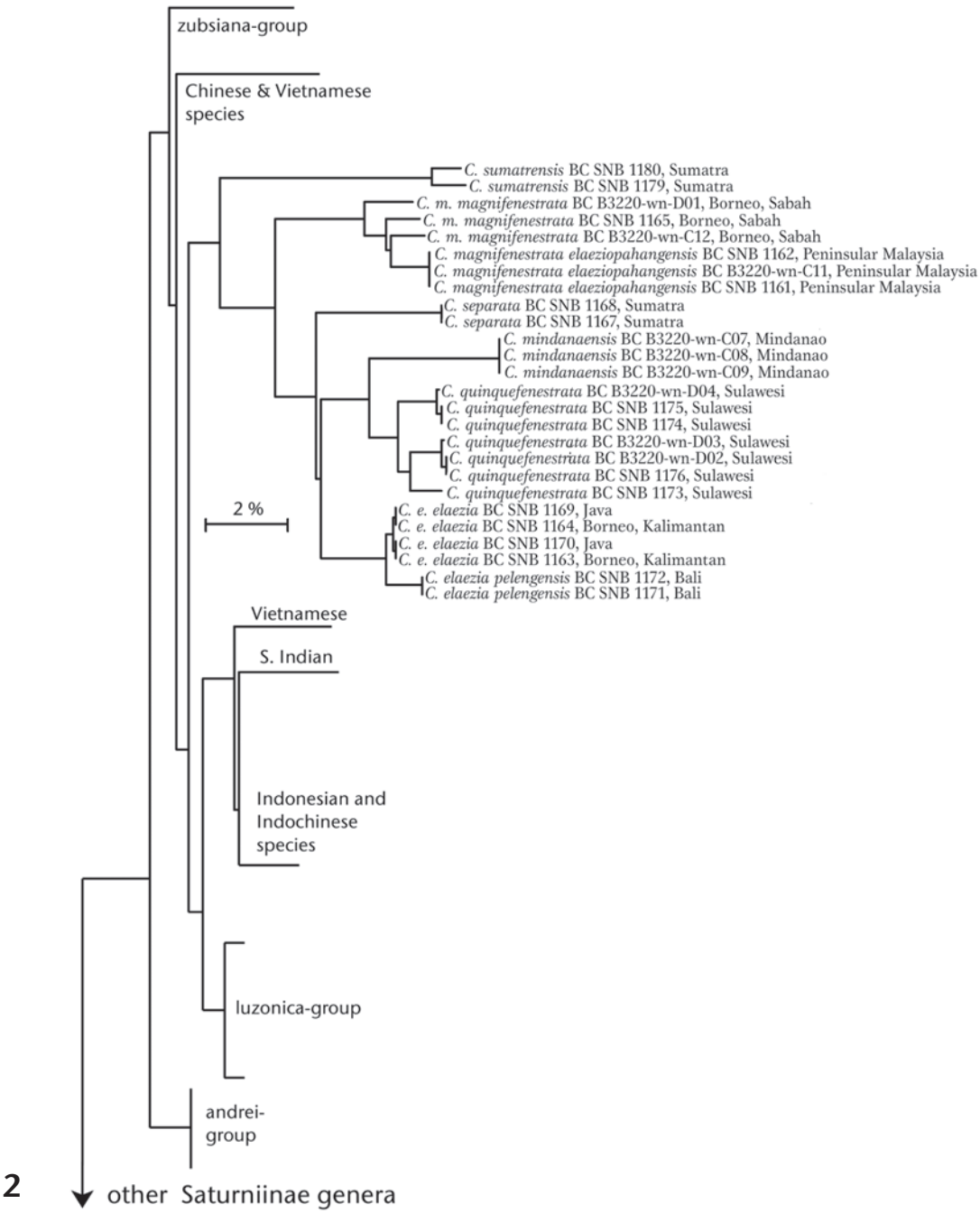
Note. Paukstadt & Paukstadt (2010b: 61) wrote that they had moved *hayatiae* back into the *trifenestrata*-group in 2009. However, the only paper of 2009 they cited is that cited here as 2009b, and in which (Paukstadt & Paukstadt 2009b: 417) they had, in fact, explicitly combined *hayatiae* with the *elaezia*-group.

The recent further "enrichment" of the *elaezia*-group through the description of many new species (Naumann & Löffler 2010a, Brechlin 2010b) came somehow as a surprise and was only made possible through the mtDNA barcode studies undertaken at Guelph. For a long time, there was not much material of the *elaezia*-group available from Peninsular Malaysia (Lampe 1984, 1985 did not even know "*C. elaezia*" from there) or Borneo (Holloway 1987 knew of only a few specimens from the upper montane forest), and from Palawan only the two types of *C.*

Fig. 1: Barcode similarity tree ("Neighbor Joining" tree or "Bold Taxon ID Tree"), calculated on 10. xii. 2009 based on data of the genus *Cricula* alone (only species of the *elaezia*-group displayed in Fig., others omitted; data submitted to Guelph by S. Naumann and W. A. Nässig only), without other genera as outgroup. Here the *elaezia*-group is found as the sistergroup to all other *Cricula,* splitting off as the first group in the first node. — Only 6 of the 7 species of the *Cricula elaezia* species-group are included; the DNA barcode of *C. palawanica* is not yet publicly available. — The two trees were produced on the Bold website ("Bold TaxonID Tree" = sequence similarity trees, distance model: Kimura 2 parameter) using the default parameters and graphically finalized by the author.

Fig. 2: Barcode similarity tree, calculated on 10. xii. 2009 based on data of the genus *Cricula* (species other than members of the *elaezia*-group only partially shown; data submitted by S. Naumann and W. A. Nässig; here only specimens with more than 500 base pairs sequenced, i.e. one specimen lacking compared to Fig. 1) combined together with the entire subfamily Saturniinae as "outgroup" (as a means of "rooting" the *Cricula* tree); the subfamily is 17 printed pages long in its entirety. The internal structure of the *elaezia*-group is basically the same as in Fig. 1 (slight differences based on 180° rotation at nodes or changes in insignificant positions; scales are slightly different, but scale bar = 2% in both figures), but here the *elaezia*-group as a whole is nested in the middle of the genus *Cricula* (splitting off only in the fourth-level node within the genus), with other groups being placed more basally. — Only 6 of the 7 species of the *Cricula elaezia* species-group are included; the DNA barcode of *Cricula palawanica* is not yet publicly available. In Fig. 2, vertical lines were strongly shortened, horizontal lines the original length within the *elaezia*-group, but truncataed for other groups before any sub-branching.





palawanica (in CRBP) are yet known (Brechlin 2001). So Beck & Näßig (2008: 161) did not expect anything else other than perhaps, at best, a separate subspecies of *C. elaezia* for Borneo.

From these publications, it may be concluded that the *elaezia*-group now (including the changes below) comprises 7 species, centered on Sundaland, with 2 outliers on Sulawesi and Mindanao which appear to be closely related sister-species. Naumann & Löffler (2010a: 11–12) counted 9 species, but this number is reduced below.

There appears to be some geographical variation in the insular (= isolated) populations of 2 of these 7 species:

- *C. elaezia* from (West-)Java and Borneo (Kalimantan) appears to be very homogeneous (nearly no differences in barcode), while the Balinese (and possibly also eastern Javanese? See Näßig 1995: 34, U. & L. H. Paukstadt 2010b: 62) specimens differ from them at a level of clearly less than 1 % (Fig. 1). These differences are further supported by slight differences in morphology.
- The barcode results of *C. magnifenestrata* Naumann & Löffler, 2010 are quite variable on Borneo, whereas the population of Peninsular Malaysia appears to be much more homogeneous, differing by about 1 % from that of Borneo (Fig. 1). Further small differences are observed in ♂ genitalia.

These differences around 1 % in the COI barcode often correspond to geographical subspecies, and the isolated populations from Bali and the Malayan Peninsula, respectively, are consequently up- and downgraded as subspecies below. In the case of *C. magnifenestrata,* the distribution of the variable and invariable DNA may suggest that the Peninsula was colonized rather recently by a small founder population from Borneo, while the differences in *C. elaezia* suggest a longer isolation of the Balinese population, with the Kalimantan specimens probably representing a rather recent immigration (or introduction?) from Java into Borneo. This approach is adopted primarily so that these similar cases are dealt with in an adequately similar way; it does not appear to be justifiable to have one of the isolated populations of these closely related species interpreted as a species, while the other is placed in synonymy and not treated as a valid taxon at all.

Therefore, several changes to the interpretations of Naumann & Löffler (2010a), Brechlin (2010b) and U. & L. H. Paukstadt (2010b, c) appear to be necessary and will be provided below in the systematic part. The changes and the present status of the taxa of the *elaezia*-group are summarized in the checklist and the resultant distributions shown in Map 1.

The results of the barcode studies

The publications on *Cricula* discussed above, Naumann & Löffler (2010a) and Brechlin (2010b) (and also Paukstadt 2010b, c), worked with the results of their respective barcode studies produced in the laboratories of the "Canadian Centre for DNA Barcoding" (CCDB) in Guelph, Ontario (Canada), but the basic data of their studies were not published (neither the base pair sequences, which will only be included into GenBank by Bold at some unspecified later date, nor the Neighbor Joining similarity trees produced on the Bold website, nor any other details, and often not even the barcode sample numbers) so that the reader cannot conduct a critical study of his own based on the original data.

For the record, and because it may be interesting to see at least the barcode similarity comparison for the *elaezia*-group, I figure two similarity trees that were produced in the course of our own work on the *elaezia*-group in 2009 (as part of the then cancelled coauthorship with S. Naumann). The database used only the submissions to Guelph of S. Naumann and myself; the Brechlin, Meister and Paukstadt data are not available for inclusion in these analyses.

Two different "trees" are shown: the first (Fig. 1) was produced by analysing data of the genus *Cricula* only; the second (Fig. 2) is based on an analysis of all Saturniinae genera barcoded so far, providing sufficient "outgroups" to "root" this similarity tree. *Cricula* species other than those of the *elaezia*-group are not shown in the figures (Fig. 1), but only as their respective species groups (Fig. 2).

The two diagrams were produced on the Bold website in December 2009 but graphically finalized for print only recently. In both analyses, the supposed monophyly, based on morphological data, of the *elaezia*-group is also supported by the barcode results. Furthermore, the internal structure of the *elaezia*-group is very similar in both diagrams (there are only minor differences not effecting the internal structure of the group as a whole). In Fig. 1 (without an "outgroup"), the *elaezia*-group is placed basally within *Cricula*, where it might be interpreted as the "sister-group" to all other *Cricula*. In Fig. 2, the *elaezia*-group is nested within the genus, which phylogenetically is an important difference.

However, the mtDNA COI barcode "Neighbor Joining trees" provided by the Bold website are just DNA overall similarity (phenetic) trees, not phylogenetic trees. Therefore, we cannot clarify the phylogeny of the genus *Cricula* based on mtDNA COI barcode studies alone. These data are often helpful at the species level to clarify species and population identities, but remain quite weak and possibly misleading at higher levels.

Nevertheless, the barcode results were very helpful to all in sorting out the internal structure of *Cricula*. Before they became available, nobody dared to allocate the new material to new taxa, because the genitalia and external morphology did not provide unambiguous clues. The barcode results, however, delivered clear results for distinguishing new species, and they also helped to show some structure within the genus. As S. Naumann (pers.

comm.) stated: "When the species are sorted in a collection according to the barcode results, one begins to see and understand again the new species-groups within the 30 species of *Cricula*, just as one could before when there were only about 15 species."

Distribution data of the *elaezia*-group

The distributional data provided in Map 1 were compiled mainly by S. Naumann and me for our cancelled manuscript. As there are no distribution maps at all for the entire ("new") *elaezia*-group in the earlier publications (neither in Naumann & Löffler 2010a nor in Brechlin 2010b), this graphical illustration may be helpful for the general reader. The map was originally compiled in late 2009 and has been slightly updated with some data from Brechlin (2010b). As I have not examined his specimens personally, I have used only some of his data, particularly type localities. The nomenclature used follows the changes suggested below in the systematic part.

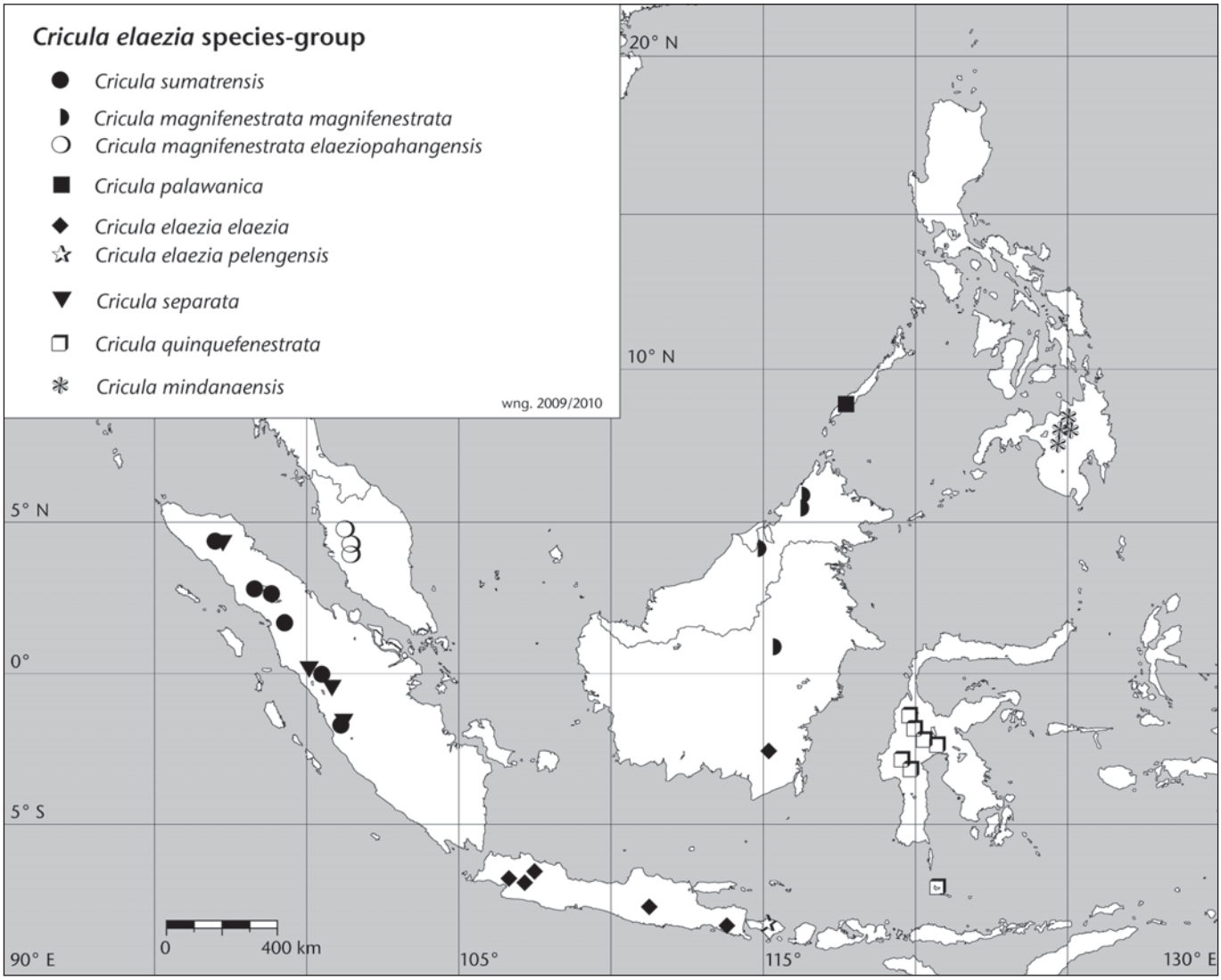
Systematic part: Revisional notes on the *elaezia*-group

(by Wolfgang A. Nässig)

I present neither illustrations of specimens (except for an older HT and the formerly undescribed ♀♀ of *C. mindanaensis* and a few more formerly unpublished specimens) and genitalia, nor long locality lists. All the species have already recently been depicted, and material listed at length, elsewhere.

Annotated catalogue of the existent taxa of the *elaezia*-group

Taxa are listed in chronological order, with annotations and notes on synonymy; the number in front of the taxon is a consecutive numbering, with a subdivision using Latin letters in alphabetic order when more than one taxon was published in the same publication. The revisional notes including the synonymies follow in the next text paragraph.



Map 1: Known distribution data of the 7 species of the *Cricula elaezia* species-group in SE Asia. Symbols may represent more than one locality in close proximity and I did not manage to locate all places from the labels on maps. Type localities that are most likely erroneous are not plotted (i.e., regarding the taxa *buruensis* and *pelengensis*). Data compiled from literature (including a few localities from Brechlin 2010b; for Sumatra see also Diehl 1997) and CWAN, CCGT, SMFL, CSBN, CSLL; additional dots for the Sumatran provice Aceh see also in U. & L. H. Paukstadt (2009a). — Map base from OMC, Martin Weinelt (www.aquarius.geomar.de/omc/; downloaded on 10. xi. 2009, this address is no longer in existence), modified and with localities added.

1. *elaezia* Jordan, 1909

Cricula andrei elaezia Jordan (1909: 303).

Type deposition: ♂ HT (by monotypy) in BMNH (examined). L.t.: Dradjad, G. Kedang, Preanger, West Java, [Indonesia]. GP BMNH Sat 348.

= *Cricula andrei elaozia* [sic]: Seitz (1926: 507 [lapsus]).

= *Cricula andrei elezia* [sic]: Bouvier (1936: 237 [lapsus]).

Distribution (see Map 1): Indonesia: [West] Java, Borneo (Kalimantan); separate subspecies on Bali.

Cited in literature as:

Cricula elaezia: Jordan (1939: 434), Roepke (1940: 27), Holloway (1981: 122, 1987: 110), Nässig (1989a: 196; 1995: 34), U. & L. H. Paukstadt (2001: 52), U. Paukstadt et al. (2009: 196 [Java]).

Comments: According to the barcoding results, *Cricula elaezia* is now considered to comprise two subspecies, which differ only at a low level of only approximately 1 % within the barcode analysis. See below. — There is a ♀ from "Java occ., Preanger, 1888" (Fig. 3) in RMNH with the following labels: "*C. andrei elaezia,* type ♀, J. H. W[atson]", "Type". This cannot be a type, because Jordan (1909: 303) explicitely only had a singleton ♂ before him when describing his taxon *elaezia,* and Watson did not describe a homonym of *elaezia.* Probably this labelling is just based on a misinterpretation.

2.a. *buruensis* Jordan, 1939

Cricula elaezia buruensis Jordan (1939: 435).

Type deposition: ♂ HT (by monotypy) in BMNH (examined). T.l. (probably erroneous labelling): "Kako Tagalago, 2700 ft., Central Buru,"[?] [Indonesia]. GP BMNH Sat 536.

Comments: This t.l. on Buru island is, as already supposed by Nässig (1989a: 196, 1995: 34), see also Nässig et al. (1996: 38), most likely based on a mislabelling of the specimen. All other *Cricula* specimens in museum collections with the same locality label are *C. trifenestrata* and zoogeographical reasoning makes it unlikely that a species of the *elaezia*-group morphologically so similar to the Sundanian members of the group can live so far east without analogous taxa being found on the intervening islands (*C. quinquefenestrata* is quite distinct). So this type specimen came most probably from Sundaland carrying an erroneous label. — In 1989, 1995 and 1996, this was no problem, because at that time it was expected that there is only one species of the group in Sundaland (i.e., *C. elaezia* itself). However, after having identified more than one species of this group within Sundaland, the correct origin might now be important, because the taxon *buruensis* might possibly be an older, valid synonym of one of the species described as new recently. The type of *buruensis* virtually does not differ from the Javanese specimens of "true" *Cricula elaezia* in the BMNH collection. It is intended to try to clarify the true identity of this type specimen of *buruensis* at a later time, if this is still possible at all. The specimen is about 80 years old, and it might be problematic to get unambiguous results, especially in the barcode analysis. If so, then it might be advisable to interpret this taxon as a "dubious taxon" and suppress it to avoid further changes of the synonymy in future.

The argument of U. & L. H. Paukstadt (2009b: 420) that the taxon *buruensis* "could be a distinct taxon, but on zoogeographical reasoning no [*older!*] synonym of *pelengensis*", is inconsistent, because as long as the correct origin of the type of *buruensis* is unknown, any "zoogeographical" reasoning is worthless. Two very different situations must be distinguished here. Either the taxon *buruensis* is based on a mislabelled specimen, whence zoogeographical reasoning can only be used when we know where the specimen really came from, and then we might even possibly discover an older synonym for a taxon from another locality (with another misleading name) — including Bali. The alternative is that there really is a member of the *elaezia*-group living on the Indonesian island of Buru. However, only new and *reliable* records (i.e., material from a scientific collecting expedition, not traders' material!) could prove this presence on Buru — and only then might the name *buruensis* be "reactivated" for the Buru population, and its zoogeographical consequences elucidated.

C. elaezia buruensis was not often cited in literature, and usually subordinate to *C. elaezia* (as subspecies or synonym).

2.b. *sumatrensis* Jordan, 1939

Cricula andrei sumatrensis Jordan (1939: 433).

Type deposition: ♂ HT by monotypy in BMNH (examined). — L.t.: West Sumatra, Mt. Korintji, 7300 ft., [Indonesia].

Distribution (see Map 1): Indonesia: Sumatra.

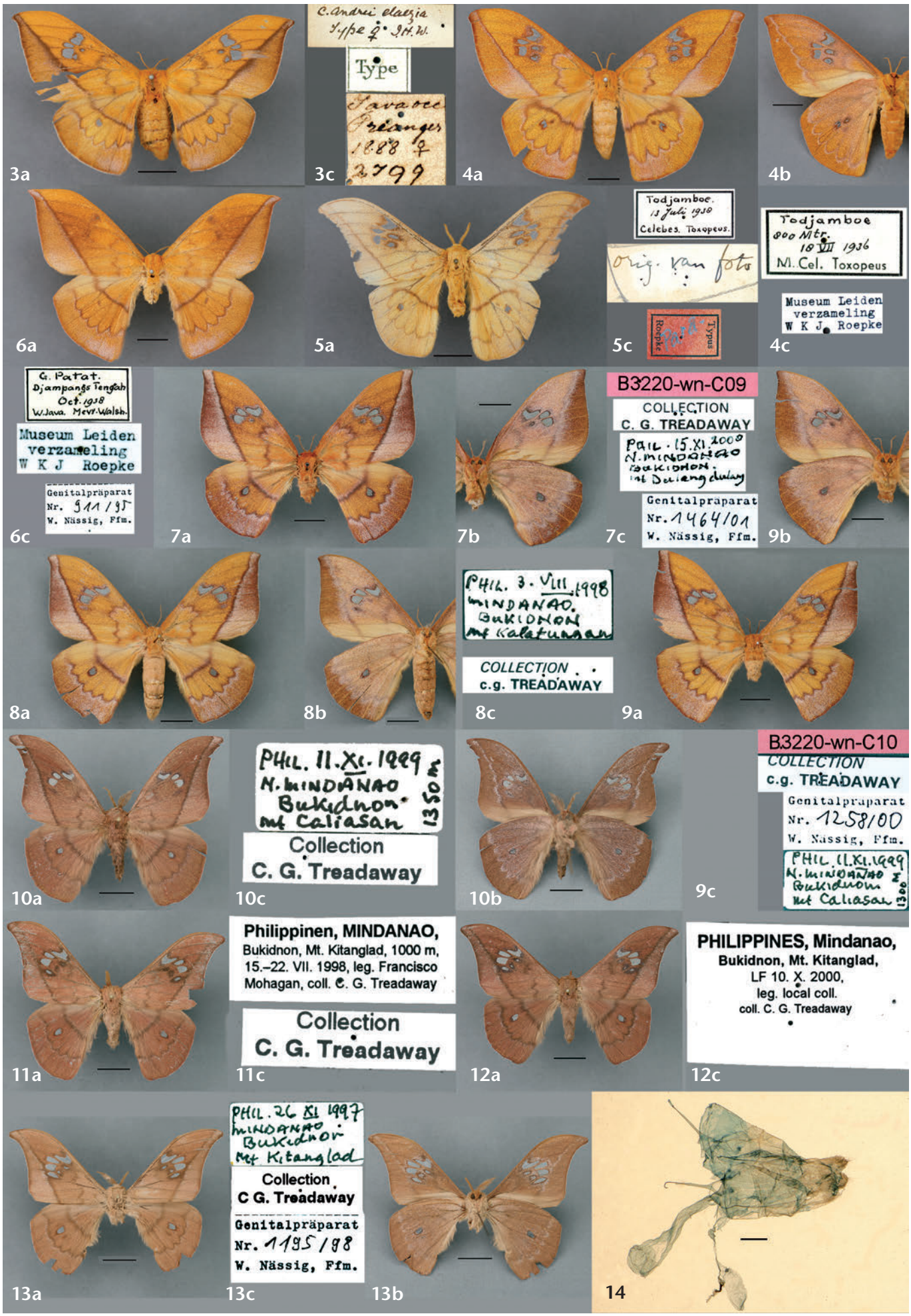
Cited in literature as:

Cricula andrei sumatrensis: Jordan (1939: 433), Holloway (1981: 123).

Cricula sumatrensis: Nässig (1989a: 195, in *andrei*-group; 1995: 33, in *andrei*-group), Nässig et al. (1996a: 36, in *andrei*-group), U. Paukstadt et al. (2009: 198 [Sumatra]), U. & L. H. Paukstadt (2009a: 344), Naumann & Löffler (2010a: 11, in *elaezia*-group). — For further locality data see also U. & L. H. Paukstadt (2009a: 344) for Aceh province (= Nanggroe Aceh Darussalam) in the North.

Comments: According to observations in Aceh by U. & L. H. Paukstadt (2009a: 344, based on 83 specimens), *C. sumatrensis* is a late night flier, arriving at light between 3:30 and 6:00 h. They found this species mostly at ca. 1800 m elevation (with only a few exceptions) and mostly in iv./v., with a few additional specimens in ii., vii. & ix. — The ♀ genitalia of *C. separata* [as *C. elaezia*] differ from those of *C. sumatrensis* and *C. trifenestrata javana* Watson, 1913 on the island of Sumatra, see Nässig et al. (1996: GP figs. 10, 12, 14). U. & L. H. Paukstadt (2010a) differentiated the ♀♀ of *C. sumatrensis, C. separata* (as *C.* "*elaezia*") and *C. trifenestrata javana* Watson, 1913 on the island of Sumatra based on barcode and genitalia morphology, but they illustrated for comparison a ♀-GP of *C. magnifenestrata elaeziopahangensis* (as *C.* "*elaezia*", bursa copulatrix not visible) instead of *C. separata* (the new taxa were just published when their paper came out). Nevertheless, their genitalia pictures (U. & L. H. Paukstadt 2010a: figs. 13–15) fit very well to the ♀ genitalia pictures already published by Nässig et al. (1996: GP figs. 10, 12, 14) and principally support the results of 1996; compare also below the comments under *C. elaeziopahangensis*. Except those of *C. sumatrensis,* the ♀ genitalia do not differ much between the species of the *elaezia*-group.

Fig. 3: *Cricula elaezia,* Java; specimen labelled as "*C. andrei elaezia* Type ♀ J. H. W[atson]", RMNH; no type specimen! — **Figs. 4–5:** Types of *C. quinquefenestrata,* RMNH. **Fig. 4:** ♀, probable HT (identified after the photo printed in the original description, not labelled as such). **Fig. 5:** ♂ PT; in spite of the label not the originally illustrated "allotype", but the 2nd ♂. — **Fig. 6:** An "afenestrous" ♀ individual from Java (RMNH), probably a ♀ of *C. elaezia*. — **Figs. 7–13:** ♀♀ and ♂♂ of *C. mindanaensis*. **Fig. 7:** ♀ from 2000, darker form, with 4 fenestrae on the fw. (the 4th in the cell). **Fig. 8–9:** orangy ♀♀ from 1998/99 with 3 fenestrae on fw.; Fig. 8 with a 4th fenestrum indicated below cell. **Fig. 10:** ♂ with 3 fenestrae on fw., 1 more indicated below the cell, another one in the cell only on the uns. **Fig. 11:** ♂ with 4 fw. fenestrae and 2 more indicated in the cell. **Fig. 12:** ♂ with 6 fw. fenestrae. **Fig. 13:** ♂, brighter brownish in colour, with 6 fw. fenestrae and in hw. one more indicated below the cell. — Always: **a** = ups., **b** = uns., **c** = labels. — **Fig. 14:** ♀ genitalia of *C. mindanaensis,* GP 1464/01 WAN in SMFL. — Photos W.A.N. — Pictures not to the same scale; labels at different scales and in part digitally cleaned for better legibility. Scale bar (where present) = 1 cm; in Fig. 14 = 1 mm.



3. *quinquefenstrata* Roepke, 1940

Cricula quinquefenestrata Roepke (1940: 30, fig. 5 ♀ HT, ♂).

Type deposition: ♀ HT by original designation in RMNH (examined; Fig. 4), 1 ♂ "allotype", 1 ♂, 10 ♀♀ PTs. The HT ♀ and a ♂ PT were illustrated by Roepke (1940), but only in poor black and white quality. Therefore, this HT is figured here in colour, and also a ♂ PT (Fig. 5); the latter is not the "allotype ♂" (in spite of the label "orig. van foto"), but the second PT ♂. — L.t.: Todjamboe, 800 m, Paloppo, Celebes [Palopo, Sulawesi Selatan, Indonesia].

Distribution (see Map 1): So far known from the Indonesian islands of Sulawesi and Tanahjampea. Most likely not on Peleng island (at least not yet documented with reliable data).

Cited in literature as:

Cricula quinquefenestrata: Roepke (1940), Holloway (1981: 123), Nässig (1989a: 197, 1995: 35), Naumann (1995: 79 *ff*., 2000: 57), Brechlin (2001: 41, 43), U. Paukstadt et al. (2009: 198–199).

Comments. There is much saturniid material (not only of *Cricula*) in collections labelled "Pulau Peleng", no further data, and usually dated "xii. 1999". Such specimens were most likely mislabelled by Indonesian traders (compare Naumann 2000: 57), and the correct origin was expected to be Sulawesi Selatan, Puncak Palopo envir. However, on basis of the "*pelengensis* incident" (see below), this should generally be rechecked against material from Bali. The specimens are sufficiently recent for barcode analysis.

4. *mindanaensis* Nässig & Treadaway, 1997

Cricula mindanaensis Nässig & Treadaway (1997: 346, col. pl. II, figs. 5, 6, fig. 14).

Type deposition: ♂ HT by original designation in SMFL (examined). — L.t.: Philippines, Mindanao, Bukidnon, Mt. Kitanglad, S-Seite, Intavas, 1200 m, 8°7′ N, 124°55′ E.

Distribution (see Map 1): Philippines: Mindanao, Bukidnon.

Cited in literature as:

Cricula "spec. nov. 1": Nässig (1995: 36).

Cricula mindanaensis: Nässig & Treadaway (1997: 346, 1998: 283), Brechlin (2001: 41).

Comments: see below in a separate section.

5. *palawanica* Brechlin, 2001

Cricula palawanica Brechlin (2001: 41, figs. 1, 2, 7).

Type deposition: ♂ HT by original designation, in CRBP, stated to be deposited in CMWM later, i.e. eventually in ZSM (not examined). — L.t.: Palawan (S), Mt. Mantalingajan, 600–800 m, Philippines.

Distribution: Philippines: Palawan (an island on the Sunda Shelf).

Comments: So far, I have not examined the 2 specimens (HT and 1 ♂ PT) known, and therefore, this taxon is not included in Figs. 1 & 2. Our concept of this taxon is based on the illustrations and the description by Brechlin (2001), and the DNA barcode is unknown to me so far. — Externally, *C. palawanica* can be easily identified on the hw. by the prominent and absolutely straight (except the foremost part) blackish postbasal line which comes very close to the hw. ocellus and is in contact with it; in nearly all other *Cricula* species, the hw. postbasal line does never touch the hw. ocellus and usually is clearly less prominent. Also, the genitalia appear to show sufficient differences in comparison with the other species of the *elaezia*-group: Valves: the spoon-like distal part of the sacculus is larger than the costal part in Bornean and especially Peninsular specimens of *C. magnifenestrata,* while both are of nearly identical size in *C. palawanica*. The valve sacculus of Bornean and Peninsular specimens of *C. magnifenestrata* has a well-developed angle a little below the spoon-like tip, while in *C. palawanica* it is evenly bent over the entire length. The scaphium (sensu Roepke 1940; i.e., either the gnathos or the transtilla, this is not yet clear) is slightly variable, but it appears that in *C. palawanica* the central notch is broader, while the shape is more rectangular in *C. magnifenestrata,* with a narrower, but sometimes deeper incised notch. The two tips of the sella (sensu Roepke) are broad and round in *C. palawanica,* but much narrower in Bornean *C. magnifenestrata,* while the Peninsular population may also show a widely separated, broad pair of lobes. — Although I have not yet seen any barcode results of the two type specimens, the morphological differences are clear enough that, on the available evidence, I think that *C. palawanica* is a separate species, probably most closely related to the Bornean *C. magnifenestrata*. — Since the two types have been found, no other specimens have been sent to Europe; probably because Palawan does not have many high mountains, which in general are poorly accessible. However, searching at higher altitudes surely would result in further specimens.

6. *pelengensis* U. & L. H. Paukstadt, 2009

Cricula pelengensis U. & L. H. Paukstadt (2009b: 420, figs. 1, 2).

Type deposition: ♂ HT by original designation (and monotypy), in CUPW, to be deposited in MZB (not examined). — L.t.: Indonesia, erroneous locality data: "Sulawesi Tenggah, Banggai Archipelago, Pulau Peleng". According to U. & L. H. Paukstadt (2010b: 62; no BC number provided), based on a barcode analysis of the HT conducted in Canada, the HT of *Cricula pelengensis* is conspecific with specimens from the Indonesian island of Bali, and thus is evidently conspecific with *Cricula baliensis* Naumann & Löffler, 2010 (see below). This is a mislabelling of a Sundaland specimen in 1999 by Indonesian traders which also occurred at the same time with Sulawesi specimens (now admitted by U. & L. H. Paukstadt 2010b: 62). In accordance with Recommendation 76A.2 of the Code, the type locality is herewith corrected from "Sulawesi Tenggah, Banggai Archipelago, Pulau Peleng" to "Bali" [without details].

Peleng does have some green (forested) mountains with maximum elevations of around 1060 m (but the hills are generally poorly accessible); this could potentially allow mountain species such as members of the *elaezia*-group to live there. However, most of the material labelled "Pulau Peleng" from Indonesian collectors and traders in German collections (especially that dated 1999) is evidently mislabelled. — It is a pity that Paukstadt did not undertake the barcoding analysis earlier and described this singleton only *after* verifying the locality data. Now we have a valid older synonym with a totally misleading name and [at least in the original description] an incorrect type locality. — Singletons (or sometimes even series) from traders with implausible or doubtful locality data should never be described.

Distribution: Bali (Peleng not plotted in Map 1 because of locality error, see above).

Cited in literature as:

Cricula pelengensis: U. & L. H. Paukstadt (2009b: 420, 2010b: 62).

Cricula baliensis: Naumann & Löffler (2010a: 10).

Comments: See also below in separate paragraph. — Insect traders are always prone to mislabelling specimens. Usually their material is collected by many different people at different places, and it reaches the trader and exporter to

Europe without correct and individual data on each separate specimen. The traders generally think that all species of a genus living parapatrically on different islands are the same. The trader stores the material in big boxes without labels, and when there is a chance to sell it, there will locality data be added just before shipping. In addition to accidentially mislabeled specimens, there are also evidently deliberate mistakes in labelling. As Naumann (2000) showed for the "Peleng" material, which was "created" from or at least "topped up" by the trader with 1999 Puncak Palopo (= Sulawesi!) and evidently also with Javanese/Balinese specimens (Naumann, Paukstadt), or as Peigler (1989: 52) and Nässig & Treadaway (1998: 241–242, 246–247) showed for *Attacus* species on the Philippines, there is a lot of exchange of material among traders, because such material sells very well in Europe, Japan and North America when labelled with whatever happens to be the then current "best selling" locality. (Of course such incorrect locality data will also be found in other material; e.g., *Antheraea paukpelengensis* Brechlin & Meister, 2009 might be such a candidate; it is based on material of the same sources. — The identity of such specimens should be checked using barcodes soon, especially when the description of new taxa is planned or new taxa were already based upon them.)

7.a. *baliensis* Naumann & Löffler, 2010

Cricula baliensis Naumann & Löffler (2010a [19. i.]: 10, figs. 75–77, 138–140).

Type deposition: ♂ HT by original designation, in CSNB, stated to be deposited in ZMHU later (examined). — L.t.: Indonesia, Central Bali, Bedugul Distr., Tamblingan N.P., 8°14′ S, 115°8′ E, 1200 m.

Distribution: Indonesia: Bali.

Cited in literature as:

Cricula pelengensis: U. & L. H. Paukstadt (2009b: 420, 2010b: 62).

Cricula baliensis: Naumann & Löffler (2010a: 10).

7.b. *magnifenestrata* Naumann & Löffler, 2010

Cricula magnifenestrata Naumann & Löffler (2010a [19. i.]: 9, figs. 70–74).

Type deposition: ♂ HT by original designation, in CSNB, stated to be deposited in ZMHU later (examined). — L.t.: Malaysia, [Borneo], Sabah, Trus Madi, 1600 m.

Distribution: Type series combined from Borneo (Malaysia: Sabah; Indonesia: Kalimantan) and Peninsular Malaysia (see systematic part below).

Cited in literature as:

Cricula magnifenestrata: Naumann & Löffler (2010a: 9–10).

Cricula magnifenestrata elaeziopahangensis [sic]: U. & L. H. Paukstadt (2010b: 62). (The new synonymies of the *elaezia*-group listed by U. & L. H. Paukstadt 2010b: p. 56–57 versus p. 62 were not consistent.)

Cricula elaezioborneensis: Brechlin (2010b: 37); U. & L. H. Paukstadt (2010d: 168).

Cricula elaeziopahangensis: Brechlin (2010b: 38).

Comments: This species appears to have two distinct subspecies, which differ not only in their barcode data (although only just below the 1 % level), but also in details of ♂ genitalia. This situation has been interpreted differently: whereas Naumann & Löffler (2010a: 9) included both Peninsular Malaysian and Bornean specimens within their type series, Brechlin (2010b: 37) described the two groups as separate species, and U. & L. H. Paukstadt (2010b: 62) interpreted the populations to be different subspecies. See below in the systematic part. — The correct (conspecific) combination of ♂♂ and ♀♀ in collections requires more barcoding or at least dissection.

7.c. *Cricula separata* Naumann & Löffler, 2010

Cricula separata Naumann & Löffler (2010a [19. i.]: 9, figs. 66–69).

Type deposition: ♂ HT by original designation, in CSNB, stated to be deposited in ZMHU later (examined). — L.t.: Indonesia, West Sumatra, Mt. Sanggul, 1250–1450 m.

Distribution: Indonesia: Sumatra.

Cited in literature as:

Cricula separata: Naumann & Löffler (2010a: 9); U. & L. H. Paukstadt (2010b: 62).

Cricula elaeziosumatrana: Brechlin (2010b: 36); U. & L. H. Paukstadt (2010b: 62, 2010c: 85, 2010d: 167).

Comments. The ♂ genitalia of this Sumatran species appear to be rather variable, as concluded from my own dissections (GP ♂ WAN, in SMFL: 99/1983, 100/1983, 101/ 1983, 587/1988, 588/1988, 596/1988). I think that further studies including more barcoding should be undertaken. — The correct (conspecific) combination of ♂♂ and ♀♀ in collections requires also more barcoding or at least dissection. — Further locality data (as *Cricula "elaezia"*): see U. & L. H. Paukstadt (2009a: 345) for Aceh province (= Nanggroe Aceh Darussalam) in the north. According to to the observations by U. & L. H. Paukstadt in Aceh (2009a: 345; based on 52 specimens), *C. separata* (as "*elaezia*") is also a late night flier, starting at midnight, with a peak between 2:30 and 5:00 h. They found this species between 1000 and 1800 m elevation and mostly in ii. and iv.–vi., with some additional specimens in iii., vii. & ix.

8.a. *elaezioborneensis* Brechlin, 2010

Cricula elaezioborneensis Brechlin (2010b [26. i.]: 37, figs. 2, 14).

Type deposition: ♂ HT by original designation, in CRBP, stated to be deposited in CMWM later (and thereby eventually in ZSM) (not examined). — L.t.: Borneo, [Malaysia], Sabah, Ranau Mts., 1600 m.

Distribution: Borneo (Malaysia: Sabah, Sarawak; Indonesia: Kalimantan).

Cited in literature as:

Cricula magnifenestrata: Naumann & Löffler (2010a: 9–10); U. & L. H. Paukstadt (2010b: 62).

Cricula elaezioborneensis: Brechlin (2010b: 37); U. & L. H. Paukstadt (2010d: 168).

8.b. *elaeziopahangensis* Brechlin, 2010

Cricula elaeziopahangensis Brechlin (2010b [26. i.]: 38, figs. 3, 15).

Type deposition: ♂ HT by original designation, in CRBP, stated to be deposited in CMWM later (and thereby eventually in ZSM) (not examined). — L.t.: Malaysia, Pahang State, Cameron Highlands, Tanah Rata.

Distribution: Peninsular Malaysia.

Cited in literature as:

Cricula magnifenestrata: Naumann & Löffler (2010a: 9–10).

Cricula magnifenestrata elaeziopahangensis [sic]: U. & L. H. Paukstadt (2010b: 62).

Cricula elaeziopahangensis: Brechlin (2010b: 37).

Note: The ♀ genitalia were illustrated by U. & L. H. Paukstadt (2010a: fig. 14, as *C.* "*elaezia*", bursa copulatrix not visible). Anyway (see above under *C. separata*), the differences between the ♀ genitalia within the *elaezia*-group (except *C. sumatrensis*) are only minor.

8.c. *elaeziosumatrana* Brechlin, 2010

Cricula elaeziosumatrana Brechlin (2010b [26. i.]: 36, figs. 1, 13).

Type deposition: ♂ HT by original designation, in CRBP, stated to be deposited in CMWM later (and thereby eventually in ZSM) (not examined). – L.t.: Indonesia, N-Sumatra, 20 km NE Sipirok, Lake Marsabut, 1350 m.

Distribution: Indonesia: Sumatra.

Cited in literature as:

Cricula separata: Naumann & Löffler (2010a: 9); U. & L. H. Paukstadt (2010b: 62).

Cricula elaeziosumatrana: Brechlin (2010b: 36); U. & L. H. Paukstadt (2010b: 62, 2010c: 85, 2010d: 167).

Systematics of and revisional notes on the *elaezia*-group

Thirteen valid taxa are listed above in the catalogue.

U. & L. H. Paukstadt (2010d: 167) also listed the following two taxa as synonyms of *C. elaezia:*

- ‡*vinosa* Watson, 1912 (Watson 1912: 343, locality: most likely [India,] Assam, vic. Cachar) and
- ‡*afenestra* Watson, 1913 (Watson 1913: 183, locality: Preanger, Java).

These were both originally described as infrasubspecific aberrations of *C. andrei* and as such are not available within zoological nomenclature (ICZN 1999, Art. 45.6.2). As far as I am aware, they have not been validly elevated into the species-group of zoological nomenclature before 1985, and so Art. 45.6.4.1 is not applicable here. Furthermore, it seems very doubtful that the first form name (‡*vinosa*) at least was based on a specimen of the *elaezia*-group; the locality as indicated in the original description (Watson was not unambiguous in his text, but I read there that India was the origin of that form of *andrei;* this is also supported by Jordan 1909: 300 and Schüssler 1933: 154) precludes it being a synonym of any member of the *elaezia*-group.

The second taxon, ‡*afenestra,* may just as easily be an individual form of *C. trifenestrata* or *C. elaezia* (*C. andrei* does not live in Sundaland) [see Fig. 6 for a ♀ from Java in RMNH with such an "afenestrous" individual form; not yet dissected or barcoded, but probably a ♀ of *C. elaezia*], and without having actually seen the original specimen at least (which has no type status; infrasubspecific forms have no types, Arts. 45.5, 45.6, 71), I do not dare to associate this form with a particular species after the bad printed photograph.

Therefore, in the following section, I shall arrange these 13 taxa of the species-group into the 7 species to which I consider they belong. This is followed by a Checklist, placed just before the Acknowledgments, in which there is a summary of the following.

The order of the species largely corresponds to the arrangement of the barcode trees (Figs. 1 & 2), which is presumed to approximate the supposed phylogeny.

Sundaland subgroup:

Cricula sumatrensis Jordan, 1939

Indonesia: Sumatra.

See also Nässig et al. (1996: 36–37, figs. 28, 41, 42, 74, GP-figs. 9, 10); U. & L. H. Paukstadt (2010a: 10–11, figs. 3–5, 9–11, GP-fig. 13).

Apparently no problems attach to this taxon; this endemic Sumatran species appears to be the first offshoot of the *elaezia*-group, probably the sister-species to all other species of the group. There is a relatively large variability between the two specimens barcoded for Figs. 1 & 2, which would (as might be expected) indicate that *C. sumatrensis* is rather old and has developed a greater genetic variability. The identity of ♀♀ in collections (possible misidentification of ♀♀ of *C. separata/C. sumatrensis* in Sumatran material) should be checked by genitalia dissection or mtDNA COI barcodes (see Nässig et al. 1996: 36, 106; U. & L. H. Paukstadt 2010a: 10–11). The ♂ (and ♀) genitalia morphology might best be explained as a relictary plesiomorphic construction (e.g., in the vesica) with some autapomorphic details (e.g., in the sella) within the *elaezia*-group.

C. magnifenestrata Naumann & Löffler, 2010

Indonesia & Malaysia: Borneo; Peninsular Malaysia.

= *Cricula elaezioborneensis* Brechlin, 2010, syn. (Naumann 2010).

= *Cricula elaeziopahangensis* Brechlin, 2010, syn. (Naumann 2010).

Comprising two subspecies:

a. *Cricula magnifenestrata magnifenestrata* Naumann & Löffler, 2010 – Borneo.

b. *Cricula magnifenestrata elaeziopahangensis* Brechlin, 2010, **stat. n.** – Malayan Peninsula (the northern border on the Peninsula is unknown).

Note. U. & L. H. Paukstadt (2010b: 62) already had this combination ("[*Cricula*] *magnifenestrata elaeziopahangensis* Brechlin, 2010 **stat. nov.**" – sic!) indicated as "new status", but regarding the opinions expressed in their publication on other pages I am pretty sure that this was just a lapsus and interprete my status statement here as being *intentionally* (in contrast to *unintentionally*) new.

As indicated above, the status of the populations from Borneo and Peninsular Malaysia has been interpreted differently in recent publications. In my opinion, a barcode difference of less than 1 % and no indication of a greater distance in the topology of the tree, in combination with so little difference in genitalia and external morphology, precludes an interpretation as two different species (as published by Brechlin 2010b). Neither, in my opinion, does the other extreme, interpreting the Peninsular and the Bornean populations as the same species and subspecies (Naumann & Löffler 2010a), adequately represent the existing differences and the present isolation of the two populations; so the position adopted by U. & L. H. Paukstadt (2010b: 62), of one species and two subspecies, seems preferable (that was also what I had suggested in the cooperation with S. Naumann just before we cancelled it).

The barcode distances within *C. magnifenestrata* on Borneo are quite variable, whereas the population of Peninsular Malaysia appears to be much more homogeneous and differs at ca. 1 % from that of Borneo (Fig. 1). Further small differences are observed in ♂ genitalia and external morphology. This distribution of DNA variability may suggest that the Peninsula was colonized rather recently by a small founder population from Borneo.

C. palawanica Brechlin, 2001

Philippines: Palawan.

See Brechlin (2001).

See the extensive information given above in the catalogue and below in the general discussion. As I do not have any material of this species before me, I cannot say more.

C. elaezia Jordan, 1909

Indonesia: Java, Borneo, Bali.

= ?*Cricula elaezia buruensis* Jordan, 1939, syn. (Nässig 1989a). (Erroneous locality, probably correct: Java.) — There is some uncertainty about this synonymy and the type locality, but for the time being it appears adequate to leave the taxon in synonymy here.

= *Cricula pelengensis* U. & L. H. Paukstadt, 2009, **syn. n.** (Erroneous locality: "Peleng"; according to U. & L. H. Paukstadt 2010b: 62 correct: Bali, corrected above.)

= *Cricula baliensis* Naumann & Löffler, 2010, **syn. n.**

Comprising two subspecies:

a. *Cricula elaezia elaezia* Jordan, 1909 — Java, Borneo.

b. *Cricula elaezia pelengensis* U. & L. H. Paukstadt, 2009, **stat. n.** — Bali.

= *Cricula baliensis* Naumann & Löffler, 2010

The morphological and barcode differences between the two populations are quite similar to the case of *C. magnifenestrata;* consequently, I prefer to adopt the same solution here. *C. elaezia* from Java and Borneo (Kalimantan) appears to be very homogeneous (nearly no differences in barcodes), whereas the Balinese specimens differ at a level of clearly less than 1 % (Fig. 1). These differences are further supported by only slight differences in morphology. The barcode differences in *C. elaezia* suggest a longer isolation for the Balinese population, with the Kalimantan specimens probably representing a rather recent invasion (or introduction?) from Java into Borneo. Whether or not the East Javanese populations of *C. elaezia* are intermediates between the two subspecies, or belong to one or the other, requires further study (U. & L. H. Paukstadt 2010b: 62). — The correct synonymy of the taxon *buruensis* can only be solved when the identity of the HT specimen is clarified. So long as there is no reliable evidence for the presence of a member of the *elaezia*-group on Buru, all speculation on such a basis is pointless.

C. separata Naumann & Löffler, 2010

Indonesia: Sumatra.

= *Cricula elaeziosumatrana* Brechlin, 2010, syn. (Naumann 2010).

See also Nässig et al. (1996: 37–38, figs. 5, 27, 29, 30, 43–45, GP-figs. 11, 12) (as *elaezia*); U. & L. H. Paukstadt (2010a: 10–11, figs. 1–2, 7–8, GP-fig. 14) (as *elaezia*).

There is rather high variability in the ♂ genitalia of this endemic Sumatran species, which should be studied in more detail. The correct identity of ♀♀ in collections (possible misidentifications of ♀♀ of *C. separata*/*C. sumatrensis*) should be assessed by genitalia dissection (see Nässig et al. 1996, U. & L. H. Paukstadt 2010a) or mtDNA COI barcodes.

Wallacea subgroup:

C. quinquefenestrata Roepke, 1940

Indonesia: Sulawesi, Tanahjampea.

The record from the island of Tanahjampea is reliable (Naumann 2000). However, this species has not yet been recorded reliably from Peleng island; specimens with such data in collections are traders' material with a high probability of mislabelling. The Sulawesian population exhibits a rather large variability in the barcode and appears to live on Sulawesi already for a long time.

C. mindanaensis Nässig & Treadaway, 1997

Philippines: Mindanao, Bukidnon province.

See Nässig & Treadaway (1997: 346–349, GP-fig. 14, col. pl. II figs. 5–6; 1998: 283–285, col. pl. 5 fig. 28, GP-pl. 6 fig. 22).

Based both on morphology and barcode data, *C. mindanaensis* is clearly the sister-species of *C. quinquefenestrata*. The species is apparently restricted to a very small area in the mountains of northern Mindanao. Some further new information is presented below in the section by Nässig & Treadaway.

General discussion on the *elaezia*-group

The species of the *elaezia*-group are all montane species, found mostly above 1000 m (Holloway 1987: 110, *C. magnifenestrata* [as *"elaezia"*] up to 2600 m; for a summary of observations for *C. "elaezia" sensu lato,* see U. & L. H. Paukstadt 2004: 185; for observations in Aceh province in N Sumatra, see U. & L. H. Paukstadt 2009a: 344–345, all localities over 1000 m for both *C. sumatrensis* and *C. separata* [as "*elaezia*"], most records around 1800 m). Only singletons have been found in the lowlands below 500 m (Allen 1981: 120, Holloway 1981: 122), and they are surely not true lowland species, in contrast to most species of the *trifenestrata*-group. This isolation by the confinement to environments of lower and upper montane forests also explains the rather fast separation into separate subspecies or species on many islands.

Life histories and the preimaginal morphology of all species of the *elaezia*-group are so far apparently unknown, probably due to the rarity of ♀♀ arriving at light, followed by no rearing attempts. At least I do not know of any [printed] publication showing the preimaginal morphology of any species of the group.

Usually, barcoding is a relatively fast and reliable way to distinguish closely related species (e.g., Decaëns & Rougerie 2008, Vaglia et al. 2008). In Lepidoptera, many authors interpret mtDNA similarities of the COI gene within the "Taxon ID tree" of the order of ≥ 2 % as indicating differences between species and differences around 1 % as intraspecific differences (between subspecies). While basing a phylogeny of higher taxa on just the COI-barcode DNA data is inadequate (on average, the COI gene evolves too fast for that purpose), a phylogeny within a small genus or species-group might be more reliably based upon the barcode data. So, the topologies of the similarity trees in Figs. 1 & 2 might perhaps be taken as a first approximation to the phylogeny of the *elaezia* species-group of the genus *Cricula,* but will need further support by different methods and character sets, and some possible future changes are indicated below.

Brechlin (2001: 41) suggested that *C. palawanica* is a member of the *elaezia* species-group that was left behind on Palawan "*en passant*", when the Philippine island of Mindanao was invaded from Borneo. However, this is evidently incorrect; both the morphological similarity as well as the DNA similarity trees (Figs. 1 & 2) suggest that Mindanao was invaded by a member of the *elaezia*-group from Sulawesi, and the species *C. quinquefenestrata* and *C. mindanaensis* inhabiting the Wallacea zone are evidently most closely related to each other as sister-species, well separated from the other species of the group on Sundaland. In any case, the shortest invasion pathway in recent times for such poor fliers as Saturniidae from Borneo to Mindanao does not lead via Balabac, Palawan and the Calamianes group to Mindoro (or via Dumaran and Cuyo to Panay) and thence back south across half of the Philippine archipelago to Mindanao (evidently without leaving any other populations behind on these islands), but rather the much shorter route along the Sulu Archipelago via Sanga Sanga, Jolo, Basilan to the Zamboanga Peninsula of Mindanao — but this path was evidently *not* used by the ancestor of *C. mindanaensis,* which most likely came from the south (Sulawesi island). (For a map of the Philippines with high elevations and mountains indicated see, e.g., Treadaway & Schroeder 2008: 26.) However, the immigration of a member of the *elaezia*-group to Palawan (= *C. palawanica*) surely did come from Borneo.

It appears unlikely that the Sumatran *C. separata* necessarily is the closest relative of the two Wallacea species [*C. quinquefenestrata* + *C. mindanaensis*] as indicated in Fig. 1; the difference from an alternative (of several) topology (*C. separata* as first branch, with *C. elaezia* as sister taxon to the Wallacea species; see Fig. 2) is insignificant, and a close relationship between Sumatra and the Wallacea area would also not be convincingly supported by zoogeographical reasoning. The Wallacea subgroup appears to be an offspring of the Javanese and Balinese *C. elaezia*. Future phylogenetic analysis should be based on more characters to obtain better data to resolve the relationships. From general morphology it may be expected that *C. separata* might even be more closely related to *C. magnifenestrata* and thus be part of a North Sundaland (or Neomalayan) connection, or else it is just an earlier offshoot from the common ancestor of [*elaezia* + *magnifenestrata* + *separata* + *palawanica*]; the possible phylogeny indicated of Fig. 2 appears here to be more likely than that of Fig. 1.

Notes on zoogeographical terminology. Nässig & Treadaway (1998: 231) provided a short review of the zoogeographical unit "Sundaland" and its subdivisional terminology. Some corrections and supplementary information are provided here:

Probably the first use of the terrestrial zoogeographical term **Sundaland** was by Mell (1930: 459), 34 years before Johnson (1964); Mell used the term to describe the distribution areas of eupterotid moths. The term Sundaland was used then by Johnson (1964) as a replacement for another previously used term "Malaya" and derivatives, when the modern state of Malaysia was founded. „Sundaland" is today used by most modern authors working on SE Asia (e.g., Barlow 1983, Holloway 1976, 1981, 1982, 1983, 1984, 1986, 1987, 1989, 1998, Knight & Holloway 1990, Eliot 1992, etc.). It covers the zoogeographical unit of the lands on the Sunda shelf, that is, the Malayan Peninsula south of the Isthmus of Kra (or south of latitude 7–10° N, depending on authors), plus the islands of Sumatra, Borneo, Palawan, Java, Bali and smaller islands between and around these larger islands. The lands east of Wallace's Line (mainly Wallacea, see Knight & Holloway 1990, and the Australian region), i.e., the Lesser Sunda Islands from Lombok to the East and Sulawesi and the Moluccas as well as the Philippines proper (except Palawan and the extreme western islands of the Sulu Archipelago), do not belong to Sundaland, because they are not situated on the Sunda Shelf (see Johnson 1964, Vane-Wright 1990).

The islands along the SW coast of Sumatra (Simeuluë, Nias, Pulau Pulau Batu, Kepulauan Mentawai, Enggano, etc.) show some degree of endemicity, but in general are best included into Sundaland. This small area constitutes a subregion of **Paramalaya** (Toxopeus 1926). Toxopeus also included the Nicobar — but not the Andaman — islands into Paramalaya, which may be questionable; there is no reliable information on the saturniid fauna of the Nicobar Islands that can be brought to bear upon this question but, for example, Ripley & Beehler (1989) grouped the Nicobar and Andaman islands together in a separate subregion closely associated with Myanmar (Burma) on the basis of their ornithofauna.

Another subdivision of Sundaland is **Neomalaya;** this term was already introduced by Moulton (1915a, 1915b) and comprises the northern core of Sundaland, which has the closest faunistic relationships: Sumatra, West Malaysia, and Borneo, and excluding Java, Bali and Palawan, as well as Paramalaya.

During most of the glaciation periods in the last ca. 1 Ma (Ma: "Mega anni", million of years), Sundaland was above the sea and formed one more or less united land mass, whereas in warmer times large areas were submerged. Species inhabiting swampy lowland forests and mangroves were able to disperse from one present-day land to the next during these times of lower sea level, while species inhabiting mountain biotopes most likely were not, except the more mobile species. However, at times even the isthmus to the Asian continent was submerged (Eliot 1992: 19–23). Today the natural northern border of the zoogeographical unit Sundaland on the Asian continent for many species appears to be the climate divide between the perhumid equatorial tropical climate and the monsoonal (seasonal tropical to subtropical) climate in the northern part of West Malaysia and south Thailand. Many species were able to cross that line and it might be expected that there are still dispersal processes going on along the Malayan Peninsula in both directions.

Although, unlike today, there was no narrow isthmus during the glaciations (even Cambodia and the southern parts of Vietnam were at times directly connected with Malaya and North Borneo: Tjia 1980, Whitten et al. 1987), there have probably been other **barriers** (e.g., big rivers – see Tjia 1980: 415 – or climatical borderlines, see MacKinnon et al. 1997: 20) in the northeastern part of the Sunda shelf, because today there appear to be more differences in the faunal composition between Vietnam and Sundaland than between Thailand/Myanmar and Sundaland.

Later research (e.g., U. & L. H. Paukstadt 1999, U. Paukstadt et al. 2000a, 2000b) provided support for the Saturniidae (and Brahmaeidae) fauna of Java and Bali appearing to be more distinct from the Neomalayan fauna than expected by earlier authors (e.g., Nässig et al. 1996). However, for example, the differences between Javanese and Neomalayan *Antheraea larissa* were only very weakly demonstrated by U. Paukstadt et al. (2000c).

As there was, at least during the most recent glaciations, no long time span between the divisions caused by the rise of the sea level between the islands of Java/Bali and Borneo/Sumatra on one side and Borneo/Sumatra and mainland Sundaland on the other (the time span for the world-wide post-glacial rise of the sea level was probably rather short), the difference in faunal composition between Java/Bali and Neomalaya must be explained differently. One important difference is climate. Java and Bali show a pronounced seasonal climate, whereas Neomalaya is a more perhumid tropical climate without distinctive seasons (except at its fringes, e.g., in southern Sumatra). Therefore, at least in the present-day, evolutionary pressures on Java/Bali are different from those on Neomalaya. The genetic exchange of less mobile bombycoid species would be interrupted by the sea level rising for only a few thousand years (mobile species even now probably still undergo genetic interchange within Sundaland!); all these present-day islands became separated by sea only about 8000–10,000 years ago. This time span is probably too short for the evolution of species-specific differences in Saturniidae. Thus, there must have been isolation mechanisms established much earlier than the end of the last glaciation preventing gene-flow between Javanese or Balinese species and Neomalayan species, e.g., possibly by large rivers and swamps between Neomalaya and Java/Bali, probably in combination with the differences in climate. The model of the "peripherical isolates" (stressed, e.g., by Nässig & Treadaway 1997, 1998 or U. & L. H. Paukstadt 1999) should, therefore, better be seen against the background of longer time spans than only 10,000 years (which was also intended in my publications).

(Written in 2000, 2007, 2008 for the webpage www.saturnia.de/Research/Sundaland.html, slightly modified and abridged.)

Notes on the formerly unknown female of *Cricula mindanaensis*

(by Wolfgang A. Nässig & Colin G. Treadaway)

After the publication of the "Saturniidae of the Philippines" (Nässig & Treadaway 1998) several further ♂♂ and the first 3 ♀♀ of *C. mindanaensis* were received, all from Bukidnon Province of Northern Mindanao. These had, in part, been collected before publication of Nässig & Treadaway (1998), but were not sent to Europe prior to 2000. Later, a few additional ♀♀ were received in Europe. These specimens are deposited in coll. C. G. Treadaway (CCGT) within the Senckenberg-Museum, Frankfurt am Main (SMFL), and also in other collections (see below).

Many of the ♂♂ are rather worn. They show more or less the same maroon ground colouration as the specimens received earlier; only the reddish tone and the intensity varies slightly, but most specimens have almost exactly the same maroon colour. The variability in colour thus far observed appears to be smaller than in other species of the genus. The main variability is found in the number, size and form of the hyaline patches on the fw., see below.

> **Data** of examined specimens: all **Philippines, Mindanao,** Bukidnon province: 1 ♂, Mt. Kitanglad, 26. xi. 1997, GP 1195/98 SMFL. 1 ♂, Mt. Kitanglad, 1000 m, 15.–22. vii. 1998, leg. loc. coll. 1 ♂, Mt. Kitanglad, 1200 m, xii. 1998, leg. loc. coll. 1 ♂, Mt. Kitanglad, 10. x. 2000, leg. loc. coll. 1 ♂, Mt. Kitanglad, ca. 1300 m, viii. 2001, leg. loc. coll. – 4 ♂♂, 1 ♀, Mt. Caliasan, 1300–1350 m, 2. ix., 10./11. xi. 1999, leg. loc. coll.; ♀-GP 1258/00, BC B3220-wn-C10. 1 ♂, Mt. Caliasan, 1400 m, 9. ii. 2000, leg. loc. coll., ♂ GP 1465/01, BC B3220-wn-C08. – 1 ♀, Mt. Kalatungan, 3. viii. 1998 [sic! Not received before ii. 2000], leg. loc. coll. 1 ♂, Mt. Kalatungan, 2. vi. 1998, leg. loc. coll., GP 2099/09. – 5 ♂♂, 1 ♀, Mt. Dulangdulang, 1× 20. x. (♂-BC B3220-wn-C07), 14./15./16. xi. 2000, leg. loc. coll.; ♀ GP 1464/01, BC ♀ B3220-wn-C09 (all these in CCGT in SMFL). – 2 ♂♂, Dalongdong Mt., 1. & 4. iv. 2000, leg. N. Mohagan, 1 ♂ GP 2099/09 Naumann, BC SNB 1177 & 1178 (CSNB).
>
> **Lfw.** of the new ♂♂ is 34.7 mm ± 1.27 S.D. (n = 11), min. = 32 mm, max. = 36 mm (still being a small *Cricula* species; the new data confirm very closely the data published in 1998: 34.3 mm ± 1.56 S.D., n = 5).

The locality data is no surprise; Mt. Kalatungan, Mt. Caliasan, Mt. Dulangdulang and Mt. Dalongdong are close to Mt. Kitanglad within the same mountain range in Bukidnon Province of northern Mindanao (see Map 2).

Not unexpectedly, the 3 ♀♀ at our disposal (Figs. 7–9, lfw. 41, 41, 41 mm) resemble ♀♀ of other species in the *elaezia*-group. The two from 1998/1999 (Figs. 8, 9) are very much alike: orange in ground colour, shaded with darker violet scales; distal area brownish violet, brighter towards the tornus. The specimen from 2000 (Fig. 7) is somewhat darker reddish-orangy brownish in ground colour. The hw. ocellus is rather large (maximally slightly more than 2 mm across), not round, but irregularly angular. On the fw., there are 2 discoidal fenestrae distad of the vein, 1 above the cell, and a 4th one is indicated inside the cell by dark scales in two of the ♀♀.

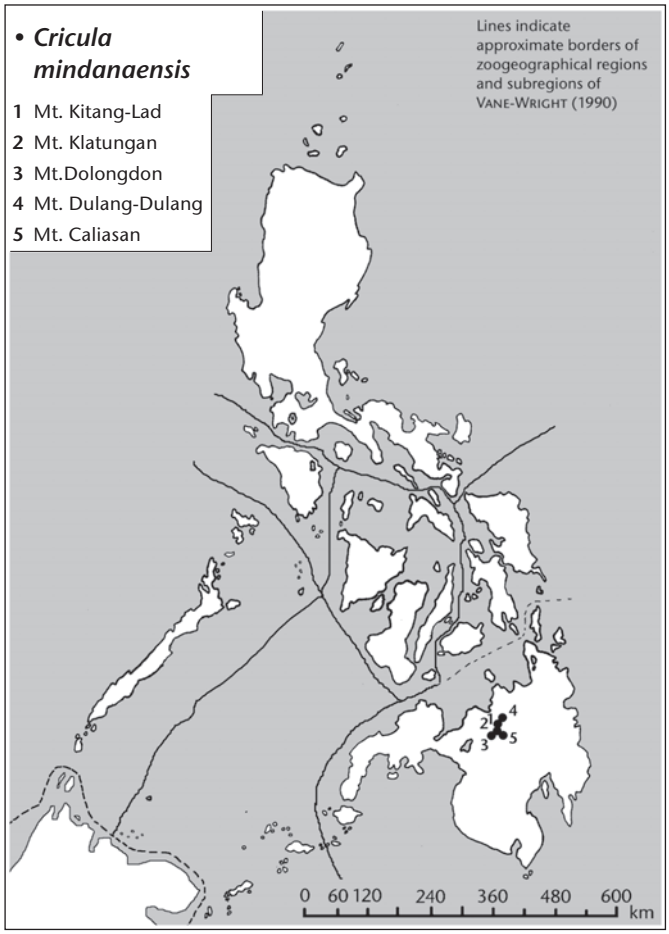
For ♂♂, examination showed from 3 (Fig. 10) to 6 (Figs. 11–13) fenestrae on the fw.: at maximum 2 small ones within the cell just basal of the discoidal vein, 2 distal of the discoidal vein, 1 – the L- or crescent- or hook-shaped fenestra – between the upper end of the discoidal vein and the costa, and 1 below the lower end of the discoidal vein (Figs. 11–13). One of the ♂♂ (Fig. 13) also shows an indication – with dark scales – of a second window on the hindwing below the ocellus. It may perhaps be expected that the ♀♀ could also show up to 6 hyaline spots on the fw. within their variability range. However, the 3 ♀♀ in CCGT do not show much variability in this respect.

The shape of the hyaline patch above the discoidal cell appears to be characteristic for *C. mindanaensis:* in all ♂♂ and ♀♀ seen by us, it is quite elongate along the vein, with

a "hook" at the basal end towards the costa. The resulting more or less L-like or sometimes nearly crescent-like shape can only be occasionally observed in other species, but it appears to be standard in *mindanaensis*.

♀ genitalia: Dissected were 2 ♀♀ (GP WAN in SMFL nos. 1258/00 and 1464/01). The ♀ GP (Fig. 14) is quite similar to those of *C. separata* (compare Nässig et al. 1996: GP fig. 12 [as *elaezia*]) and *C. magnifenestrata elaeziopahangensis* (compare U. & L. H. Paukstadt 2010a: fig. 14 [as *elaezia*]).

Several ♂♂ that most probably also belong to *C. mindanaensis* (they have not yet been dissected, but one of the authors [W.A.N.] has seen them) were received by Ron Brechlin (pers. comm. 2000) from the Dolongdong Mountain area (4 ♂♂ with Bukidnon, Mt. Dolongdong, 40 km NW Maramag, Talakag, 1300 m, 20.–29. ix. 1999, in CRBP; and a few more ♂♂ with different data). In CSLL, there are 4 ♂♂ of *C. mindanaensis* and a single ♀ which probably also belongs to that species [seen in 2008, W.A.N.]. Further 3 ♂♂ have been seen during a visit [in 2000, W.A.N.] in CUPW, and additional specimens might be expected in other collections.



Map 2: Distribution of *Cricula mindanaensis* on Mindanao, Bukidnon Province, within the Philippines. — Localities: 1 = Mt. Kitanglad (also known as Mt. Kitang-Lad [correct pronunciation!] or Mt. Katanglad). 2 = Mt. Kalatungan. 3 = Mt. Dolongdon (also spelled Mt. Dalongdon). 4 = Mt. Dulangdulang. 5 = Mt. Caliasan(?, this locality was not found on the maps, but according to information from the collector this mountain should be in the Kalatungan Range). — From Nässig & Treadaway (1998), modified and supplemented; with zoogeographical regions of the Philippine Archipelago indicated (after Vane-Wright 1990).

To our present knowledge, *C. mindanaensis* appears to be a relatively rare endemic of the Mt. Kitanglad, Mt. Caliasan, Mt. Kalatungan, Mt. Dulangdulang and Mt. Dolongdong range of north-central Mindanao (Bukidnon Province), at elevations of ca. 800–1400 m (and possibly higher up) (see Map 2). Most likely the species will also be found on other mountains in this area. Evidently there are several generations a year.

This distribution pattern is very similar to that of *Lemaireia schintlmeisteri* Nässig & Lampe, 1989, and there appears to be a centre of endemism in this mountain range of northern Central Mindanao (Bukidnon Province). Interestingly, for Lycaenidae butterflies, *Catapaecilma nuyda* Takanami, 1988 is also a Philippine endemic found only on the Mt. Kitanglad range of mountains.

Check-list of the revised *elaezia*-group

(by Wolfgang A. Nässig)

Systematic and synonymic list of the 7 presently known species of the *elaezia* species-group of the genus *Cricula,* with their subspecies and distribution areas, arranged in systematic order (largely following Figs. 1, 2):

Sundaland subgroup:

Cricula sumatrensis Jordan, 1939 — Sumatra

Cricula magnifenestrata Naumann & Löffler, 2010 — Borneo, Malayan Peninsula

Two subspecies:

Cricula magnifenestrata magnifenestrata Naumann & Löffler, 2010 — Borneo

= *Cricula elaezioborneensis* Brechlin, 2010, syn. (Naumann 2010).

Cricula magnifenestrata elaeziopahangensis Brechlin, 2010, **stat. n.** — Malayan Peninsula

Cricula palawanica Brechlin, 2001 — Palawan

Cricula elaezia Jordan, 1909 — Java, Borneo, Bali

= ?*Cricula elaezia buruensis* Jordan, 1939, syn. (Nässig 1989a). (Erroneous locality, probably correct: Java?)

Two subspecies:

Cricula elaezia elaezia Jordan, 1909 — Java, Borneo

Cricula elaezia pelengensis U. & L. H. Paukstadt, 2009, **stat. rev.** — Bali [sic].

= *Cricula baliensis* Naumann & Löffler, 2010, **syn. n.**

Cricula separata Naumann & Löffler, 2010 — Sumatra

= *Cricula elaeziosumatrana* Brechlin, 2010, syn. (Naumann 2010).

Wallacea subgroup:

Cricula quinquefenstrata Roepke, 1940 — Sulawesi, Tanahjampea

Cricula mindanaensis Nässig & Treadaway, 1997 — Mindanao

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(by Wolfgang A. Nässig)

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