Evidence for the existence of three species in the genus Archaeoattacus (Lepidoptera: Saturniidae)

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Abstract. 27 specimens of the genus Archaeoattacus Watson [in Packard], 1914 were DNA barcoded. This resulted in three clearly different clusters: the first is a purely Himalayan group (i.e., nominotypical Archaeoattacus edwardsii (White, 1859)); the second is Ar. staudingeri (Rothschild, 1895) from Sundaland including the Malay Peninsula; the third comprises samples from all other parts of the continental range of the first species excluding the Himalaya, but also including the Malay Peninsula. For this population the name Ar. malayanus (Kurosawa & Kishida, 1984), stat. n. is available. The relationships between these three species as inferred from DNA barcode analysis were unexpected, with Ar. staudingeri being very close to Ar. malayanus, while Ar. edwardsii is more genetically distant in spite of the close similarity in morphology. Small, but evidently constant differences in male genitalia between the Himalayan Ar. edwardsii and the Indochinese Ar. malayanus support the distinction. The rooted mtDNA barcode tree, a distribution map, the types of the three species involved and several male genitalia are illustrated.

Key words: DNA barcoding, Oriental region, integrative taxonomy.

INTRODUCTION

The first two authors (W.A.N. & S.N.) were recently asked by Jeremy D. Holloway, London, about the status of several Sundanian species of Saturniidae for his new checklist of the Lepidoptera in this area. After preliminary analyses of the mtDNA COI barcode data we had gathered for the oriental genus Archaeoattacus Watson [in Packard], 1914, we observed genetic divergences suggesting the existence of three distinct species, thus contrasting with the current taxonomy of the genus recognizing only two species: Ar. edwardsii (White, 1859) and Ar. staudingeri (Rothschild, 1895) (see, e.g., Holloway, 1987: 112; Beck & Nässig, 2008: 160).

This result, which was not a total surprise to us since we had already seen similar patterns elsewhere (e.g., Naumann & Nässig, 2010), is further investigated in this work through an integrative approach combining molecular and morphological data.

HISTORY

The genus Archaeoattacus was described by J. H. Watson in Packard (1914: 265); its type species by original designation is Attacus edwardsi [sic, recte edwardsii] White (1859: 115) (Fig. 2), type locality “Dhargeeling” [= Darjiling, West Bengal, India].

A second species, Attacus staudingeri Rothschild, 1895(: 36) (Fig. 4), was already included into Archaeoattacus by Watson in Packard (1914: 265) and
later also by, e.g., Schüssler (1933: 22) and Bouvier (1936: 321-322). Its type locality is “NW Java” [probably correct: W Java, see below]. Seitz (1926: 502-503) introduced a misspelling (“‡Archaeoattacus”) without using it at the generic level and without making any clear distinction from species within the genus \textit{Attacus}.

Watson in Packard (1914: 265) suggested to probably also include as third species in \textit{Archaeoattacus} “a new smaller species, as yet undescribed, from Thibet, which M. Charles Oberthür has shown me in his collection.” This species was described by Oberthür (1914: 56) as Desgodinsiia watsoni [gen. et sp. n.], but because of homonymy of the generic name (see Fletcher & Nye, 1982: 50, 145), it was then for a long time included in the genus \textit{Samia} Hübner, 1819 (for a review, see, e.g., Lemaire & Peigler, 1982).

Much later Brechlin (2007) described a new genus, \textit{Archaosamia} Brechlin, 2007, for the species \textit{watsoni}.

About 50 years after Seitz, Schüssler and Bouvier, treating \textit{Archaeoattacus} as a subgenus within \textit{Attacus}, Kurosawa & Kishida (1984: 132) described \textit{Attacus (Archaeoattacus) edwardsii malayanus} (Fig. 3), a subspecies from the “Cameron Highlands, Malay Peninsula.” Brosch \textit{et al.} (1999: 39) formally synonymized this subspecies with \textit{Ar. edwardsii}, because there did not appear to be constant and convincing differences from the broadly distributed non-Himalayan Asian mainland population in external and \textit{♂} genitalia morphology. Peigler (1983 and especially 1989: 113) described some differences between the Malaysian and “Indian” specimens, but interpreted this as a clinal grade between “India” and Peninsular Malaysia along the IndoChinese Peninsula.

This subspecies \textit{malayanus} was also recorded from Borneo (Malaysia, Sarawak, near Miri) by Fukuda (2001: 90). However, this locality is doubtful (Peigler & Naumann, 2003: 32 stated categorically that this record is erroneous; U. & L. H. Paukstadt, 2006: 178-179 expressed doubt; but compare U. & L. H. Paukstadt, 2010: 163 where the authors mentioned “very few scattered records for Borneo”). There have been extensive collecting efforts in that area of Borneo, and to our knowledge this species was not found again. We think that it might have been either some mislabelled traders’ material that probably came from West Malaysia or even Thailand or further North, or, alternatively, it might have been a recently introduced population. A natural immigration into Sarawak from the Malay Peninsula, for a species preferring mountainous environments (U. & L. H. Paukstadt, 2006: 178-179 classified the taxon explicitly as a “highland taxon”), is, however, unlikely.

Lampe (1984 [20. x.], 1985) was the first author to report the sympatric occurrence of \textit{Ar. edwardsii} and \textit{Ar. staudingeri} on the Malay Peninsula; the paper by Kurosawa & Kishida (1984 [xii.]) was published shortly after in the same year, and they evidently did not know \textit{Ar. staudingeri} from the Peninsula at that time.

**RESULTS OF THE DNA BARCODE ANALYSIS: NEW EVIDENCE SUGGESTING THE EXISTENCE OF THREE DISTINCT SPECIES**

A total of 27 DNA barcodes were generated (see Decaëns & Rougerie, 2008 for details and references relative to the laboratory protocols used) and analysed, including 16 samples of \textit{Ar. edwardsii sensu lato} and 11 samples of \textit{Ar. staudingeri}. The sample distribution for the former species ranges from West Bengal (Himalayan India) to the Cameron Highlands (Peninsular Malaysia), thus encompassing the range of the typical \textit{Ar. edwardsii} (described from West Bengal) and of the synonymized subspecies \textit{malayanus} (described from the Cameron Highlands). The generation of DNA barcodes for samples from other regions (e.g. India: Nagaland; Laos; Vietnam) is still pending, but these are not expected to affect the results presented here.

We also included in our analysis a few specimens of the closely related genera \textit{Samia} and \textit{Archaosamia} as outgroups. \textit{[Archaosamia] is generally included within \textit{Samia} (see Peigler & Naumann, 2003), and \textit{Samia}, in addition to \textit{Attacus Linnaeus, 1767 and Coscinocera Butler, 1879, is often considered to be closely related to \textit{Archaeoattacus}.]}

The dataset for all the samples used in our analyses is publicly accessible on Bold (The Barcode of Life Data Systems, see Ratnasingham & Hebert, 2007) within the following projects: SNPUB, SKPUB, RRPUUB, MMPUB and SWNPUB. Sequences have also been deposited in GenBank (see Table 1).

The preliminary analysis of sequence similarity using the analytical component of Bold (Neighbor Joining analysis based on K2P distances) revealed the existence of three distinct genetic clusters, and this pattern was confirmed by analysis of the sequences using the maximum parsimony (MP) and maximum likelihood (ML) phylogenetic reconstruction methods (results not shown), all three methods yielding the same general topology. Here we present the results of the Neighbor Joining (NJ) analysis run in MEGA4 (Tamura \textit{et al.}, 2007) using K2P distances, with bootstrap support values calculated after 1000 replications.
The three clusters within the genus are:

1. A Himalayan group of *Archeoattacus edwardsii* specimens;
2. *Ar. staudingeri* from Sundaland including the Malay Peninsula (Lampe, 1984, 1985);
3. A group of *Ar. edwardsii* samples from non-Himalayan continental Asia (China, Thailand), including the Malay Peninsula.

These three clades, as displayed in Fig. 1, are all well supported (bootstrap values of 100, 82 and 76 for the clusters (1), (2) and (3) described above, respectively). Clearly, *Ar. edwardsii* as currently defined (including all populations from the Himalaya, mainland Asia and the Malay Peninsula) does not form a cohesive genetic group with respect to DNA barcode data, and the genetic structure rather suggests the existence of three distinct lineages, with the lineage distributed in non-Himalayan mainland Asia and the Malay Peninsula.

### Table 1. GenBank Accession numbers for the specimens used here.

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The three clusters within the genus are:

1. A Himalayan group of *Archeoattacus edwardsii* specimens;
2. *Ar. staudingeri* from Sundaland including the Malay Peninsula (Lampe, 1984, 1985);
3. A group of *Ar. edwardsii* samples from non-Himalayan continental Asia (China, Thailand), including the Malay Peninsula.
representing the currently synonymized taxon *malayanus*. Besides, the topology of the phylogenetic tree (as recovered from NJ, MP and ML analyses) suggests that *malayanus* is more closely related to *Ar. staudingeri* than to *Ar. edwardsii* (as also reflected by K2P distances: the smallest distance observed between *malayanus* and *staudingeri* is 1.4%, versus 3% between *malayanus* and the typical *edwardsii*).

This contradicts the original placement of *malayanus* as a subspecies of *edwardsii*, and suggests its validity as a distinct species given its occurrence in sympatry with *Ar. staudingeri* in the Malay Peninsula, a well-defined species from which it can easily be distinguished by clear differences in external morphology and small, but visible differences in ♂ genitalia. Whereas the external morphology of the moths suggested, in contrast, that *edwardsii* and *malayanus* are very closely related taxa, it is interesting to note that the unexpected pattern of relationships described above is consistent with the relationships and the distribution data reported for other groups of Saturniidae (e.g., *Saturnia* (*Rinaca*) *zuleika* Hope, 1843 and *S.* (*R.*). *lesoudieri* Le Moult, 1933, see Naumann & Nässig, 2010, but without the Sundaland component).

**Further morphological evidence**

We were unable to reliable distinguish the Himalayan *Ar. edwardsii* and the Indochinese *Ar. malayanus* in external imaginal morphology. However, there appear to be subtle consistent differences in ♂ genitalia morphology: The genitalia of *Ar. edwardsii* (GPWAN SMFL nos. 2127/10-2129/10; see Fig. 5) are

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**Figure 1.** Neighbor Joining tree based on K2P distances for the 27 representatives of genus *Archaeoattacus* used in this study, plus 6 selected outgroups within the genera *Samia* and *Archaeosamia*. The tree was constructed using MEGA4, including all codon positions, with all ambiguous positions removed for each sequence pair. Bootstrap support values for the main genetic clusters are given above branches and were generated after 1000 replicates.
slightly larger, the valve apex is slightly more elongate and rounded; the phallus is slightly longer, with a slightly different shape, and its apical sclerotisation before the vesica is longer. These differences cannot easily be seen from photographs (scales are often slightly different among pictures), but when the genitalia are compared directly, they are easily visible. There is some variability in the genitalia of *Ar. malayanus* studied by us (GP WAN/SMFL no. 2130/10-2132/10; GP SNB 374/99-382/99, 394/99-395/99; Figs. 6-10), but all are smaller than *Ar. edwardsii*, and there is evidently no overlap with that species. There is almost no difference in genitalia between *Ar. malayanus* and *Ar. staudingeri* (see Fig. 11), an observation corroborating the relationships resulting from the analysis of barcode data.

The preimaginal instars of *Ar. edwardsii* from N. India (Himalaya) and of *Ar. staudingeri* from N. Sumatra were illustrated in colour by Lampe (2010: 260-261, pls. 254-255, legend p. 357) and *Ar. staudingeri* from Borneo, by Häuser et al. (1996) and also (but with respect to Himalayan *Ar. edwardsii* or Assamese *Ar. malayanus*) in several other publications. The differences in larval morphology between the Himalayan *Ar. edwardsii* and the Sundanese *Ar. staudingeri* are only minor but clear (compare the illustrations in Lampe, 2010). The preimaginal stages of the Indocheinese population of *Ar. malayanus* have evidently not yet been described and illustrated in colour. Pinratana and Lampe (1990: pl. 1, fig. 1), show a larva of *Ar. edwardsii* from “N. India” (probably from the same source like in Lampe 2010?), but as the authors often do not provide exact locality data, this is not fully conclusive (“N. India” may be either the Himalayan *Ar. edwardsii* or the Assamese *Ar. malayanus*) and requires further studies on basis of the updated taxonomy of the genus.

As a consequence of the congruent results of our molecular and morphological analyses, we propose to reinstate the previously synonymized taxon *malayanus* as a valid species within the genus Archaeoattacus. An updated checklist for the genus is provided below, including the geographical distribution of the three species as currently known to us.

It is interesting to note that in their later instars, the larvae of *Archaeoattacus*, as far as is known, present a unique characteristic that we consider a possible behavioural synapomorphy for the genus: they could all be considered “lumberjacks,” chewing the twigs of their foodplants and letting them fall to the ground (e.g., Kuyten, 1962; Nässig, 1983; U. & L. H. Paukstadt, 1989; Häuser et al., 1996). Also, the mature larvae produce a lot of silk and use it to fix many leaves, after cutting the petioles, to the twig near their cocoon, possibly to enhance its camouflage. Both traits may occasionally occur in species of the genus *Attacus*, but they have never been reported as regular behaviour there.

**Abbreviations**

**Abbreviations of collections:**

BMNH: The Natural History Museum, London (formerly British Museum (Natural History)), U.K.

CRRR: Collection Rodolphe Rougerie, Rouen, France.

CSKK: Collection Steve Kohil, Kayl, Luxembourg.

CSLL: Collection Swen Löfler, Lichtenstein/Sachsen, Germany.

CSNB: Collection Stefan Naumann, Berlin, Germany.

CWAN: Collection Wolfgang A. Nässig, now in SMFL.


MZB: Museum Zoologicum Bogoriense, Cibinong, Bogor, West Java, Indonesia.

NSMT: National Science Museum, Natural History, Tokyo, Japan.

SMFL: Senckenberg-Museum, Frankfurt am Main, Lepidoptera collection, Germany.

ZMHW: Zoologisches Museum der Humboldt-Universität, Berlin, Germany.

**Other abbreviations and conventions:**

[Invalid and unavailable name.

BC [no.] Barcode [with number].

GP [no.] Genitalia dissection [with number].

**Annotated checklist of the genus**

Archaeoattacus

Distribution data are also illustrated on a map (see Map). The doubtful records for SW India from Cotes (1891) are not included.

*Archaeoattacus edwardsii* (White, 1859)

*Attacus edwardsii* White (1859: 115, pl. Annulosa lvii); type locality [India, West Bengal], [Darjiling]. Type (syntype) in BMNH [photo examined, Fig. 2].

**Distribution**: Himalaya (N. India, Nepal, Bhutan, China: Tibet).


India, West Bengal: Darjiling, Mangpu road, 1900 m, leg. W. Thomas, BC B3220-wt-G02, GP WAN/SMFL 2127-2129/10 (CWAN in SMFL). – Uttarakhand: Musuri (Mussoorie): Cotes (1891: 73).– Arunachal Pradesh (north of the Brahmaputra river, Himalaya): Along District, near Rapum, 2000-2100 m, 28.31589° N, 94.15221° E, leg. Bretschneider, BC 1893 SNB (CSNB). Near Rapum, 2000 m, 28.53176° N, 94.24941° E, leg. Bretschneider, BC B3220-wn-G02, GP WAN/SMFL 2127-2129/10, GP SNB 374/99-382/99, 394/99-395/99; Figs. 6-10), but all are smaller than *Ar. edwardsii*, and there is evidently no overlap with that species. There is almost no difference in genitalia between *Ar. malayanus* and *Ar. staudingeri* (see Fig. 11), an observation corroborating the relationships resulting from the analysis of barcode data.

The preimaginal instars of *Ar. edwardsii* from N. India (Himalaya) and of *Ar. staudingeri* from N. Sumatra were illustrated in colour by Lampe (2010: 260-261, pls. 254-255, legend p. 357) and *Ar. staudingeri* from Borneo, by Häuser et al. (1996) and also (but with respect to Himalayan *Ar. edwardsii* or Assamese *Ar. malayanus*) in several other publications. The differences in larval morphology between the Himalayan *Ar. edwardsii* and the Sundanese *Ar. staudingeri* are only minor but clear (compare the illustrations in Lampe, 2010). The preimaginal stages of the Indocheinese population of *Ar. malayanus* have evidently not yet been described and illustrated in colour. Pinratana and Lampe (1990: pl. 1, fig. 1), show a larva of *Ar. edwardsii* from “N. India” (probably from the same source like in Lampe 2010?), but as the authors often do not provide exact locality data, this is not fully conclusive (“N. India” may be either the Himalayan *Ar. edwardsii* or the Assamese *Ar. malayanus*) and requires further studies on basis of the updated taxonomy of the genus.

As a consequence of the congruent results of our molecular and morphological analyses, we propose to reinstate the previously synonymized taxon *malayanus* as a valid species within the genus Archaeoattacus. An updated checklist for the genus is provided below, including the geographical distribution of the three species as currently known to us.

It is interesting to note that in their later instars, the larvae of *Archaeoattacus*, as far as is known, present a unique characteristic that we consider a possible behavioural synapomorphy for the genus: they could all be considered “lumberjacks,” chewing the twigs of their foodplants and letting them fall to the ground (e.g., Kuyten, 1962; Nässig, 1983; U. & L. H. Paukstadt, 1989; Häuser et al., 1996). Also, the mature larvae produce a lot of silk and use it to fix many leaves, after cutting the petioles, to the twig near their cocoon, possibly to enhance its camouflage. Both traits may occasionally occur in species of the genus *Attacus*, but they have never been reported as regular behaviour there.

**Abbreviations**

**Abbreviations of collections:**

BMNH: The Natural History Museum, London (formerly British Museum (Natural History)), U.K.

CRRR: Collection Rodolphe Rougerie, Rouen, France.

CSKK: Collection Steve Kohil, Kayl, Luxembourg.

CSLL: Collection Swen Löfler, Lichtenstein/Sachsen, Germany.

CSNB: Collection Stefan Naumann, Berlin, Germany.

CWAN: Collection Wolfgang A. Nässig, now in SMFL.


MZB: Museum Zoologicum Bogoriense, Cibinong, Bogor, West Java, Indonesia.

NSMT: National Science Museum, Natural History, Tokyo, Japan.

SMFL: Senckenberg-Museum, Frankfurt am Main, Lepidoptera collection, Germany.

ZMHW: Zoologisches Museum der Humboldt-Universität, Berlin, Germany.

**Other abbreviations and conventions:**

[Invalid and unavailable name.

BC [no.] Barcode [with number].

GP [no.] Genitalia dissection [with number].
Archaeanthacus malayanus (Kurosawa & Kishida, 1984), stat. n.

Attaeus (Archaeanthacus) edwardsii malayanus Kurosawa & Kishida (1984: 132); type locality Peninsular Malaysia, Cameron Highlands. Holotype (by original designation) in NSMT, Japan [photo examined, Fig. 3].

Formally synonymized with Ar. edwardsii by Brosch et al. (1999: 39).

Distribution: India (Meghalaya; southern Arunachal Pradesh?, Nagaland?, no barcode results yet from these latter two); Myanmar, China, Thailand, Laos, Vietnam, Peninsular Malaysia; Borneo?.

India, Meghalaya: Khasi Hills, vic. Shillong, traders’ material, GP WAN/SMF no. 409/86, 2131/10-2132/10 (CWAN in SMFL). Khasi Hills, Shillong env., Maiphlang, 600-1000 m, GP 374, 375, 382/99 SNB, BC 1894 SNB (CSNB). Meghalaya, [Khasi Hills], BC SK 9207. — Arunachal Pradesh (south of the Brahmaputra river), Jairampur, [Changlang District, 20°21’5” N, 96°0’59” E; the city is at an elevation of around 880-900 m], from a photo by A. Vaidya (in litt. to I. J. Kitching, pers. comm.). [This specimen comes from a locality south of the Brahmaputra river valley and is most likely Ar. malayanus, but we have no specimens and barcode results from there.]


Note: The altitudes given in the locality lists, especially for Chinese localities, refer mainly to the records of dealers, and we strongly suspect that altitudes given as, e.g. 4000 m or higher, for localities in Yunnan or Tibet, refer to the height of the mountain summit rather than to the real collecting locality somewhere on its slopes; serious data confirmed by European collectors range over lower altitudes (see also Naumann & Næssig, 2010: 56).


Laos: Brosch et al. (1999: 38); Central Laos, ca. 100 km E Louangphrabang (= Luangprabang), ca. 1400-1600 m (CWAN in SMFL). Phongsaly, Gnoi-ou (CSNB). — Louang Prabang Prov.: Phou Khoum, 1600 m (CSLL). — Vientiane Prov.: Ban Viang Khom, ca. 15 km S Phou Khoum, 950 m (CSLL). — Attapeu Prov.: Dak Pok (CSLL).


Peninsular Malaysia: Genting Highlands, 1500 m (Lampe, 1984, 42

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Ar. malayanus is ranging from ca. 500-2400 m.

Pinatara and Lampe (1990: 4) report specimens collected in Chiang Mai province, Thailand, in v.-viii. Specimens were found in Myanmar in iii. (Tenasserim), viii./ix. (other provinces), in Yunnan in v. and other months, in S Laos in iii., in Peninsular Malaysia in xii.-v and ix. The tropical populations will probably be found at any time of the year, except during extended dry periods.

As there was never any distinction made between the Himalayan and extra-Himalayan populations of “edwardsii” prior to this work, and because both species are found in “North India” (i.e., Ar. edwardsii in the Himalaya only, Ar. malayanus in Meghalaya, probably southern Arunachal Pradesh and Nagaland), the literature concerning distribution, morphology and preimaginal stages (and other papers) is rather ambiguous with respect to the actual taxon treated therein. For example, the specimen from Myanmar figured by Peigler & Naumann (2003: fig. 89) as “Archaeoattacus edwardsii” surely is Ar. malayanus.

Archaeoattacus staudingeri (Rothschild, 1895)

Attacus staudingeri Rothschild (1895: 36); type locality “NW Java;” from label of lectotype: “Tjisoloal, [189]2-93, G[e]relak [6°57’0” S, 106°26’0” E, which in fact is W, but not really "NW" Java (close to the southern coast of W Java!).” – Lectotype in ZMHU (designated by Nässig et al., 1996: 25) [examined, Fig. 4].

Distribution: Sundaland (Sumatra, Peninsular Malaysia, Borneo, Java). – Peigler and Wang (1996: 59) suspected Archaeoattacus staudingeri to also live on the island of Bali, based on a picture on a T-shirt. However, this has not been subsequently confirmed (see Peigler & Naumann, 2003: 47), and we believe that the species does not inhabit Bali. From the eyespots shown on the T-shirt image, we suppose that a specimen or, more likely, a photograph of Archaeoattacus edwardsii or Ar. malayanus was the model for that (not quite naturalistic) depiction.

Indonesia, Java: West Java, Tjisoloal, G[e]relak, Java occ. mer. [= NW Java], type locality (of the lectotype); Gn. Halimun National Park, 900-1000 m; Gn. Gedei, 1000 m; Goalpara, 1500 m (all in MZB, see U. Paukstadt et al., 2008: 229, 231). – East Java, Malang, 1200 m, leg. U. & L. H. Paukstadt, BC 1884 & 1885 SNB (CSNB, CWAN in SMFL).


Malaysia, Borneo, Sabah: Mt. Kinabalu area: Taman Kinabalu Park Headquarters (1200-1500 m), Poring Hot Springs (600 m), Sayap (1000-1100 m) (Häuser et al., 1996: 171) (CWAN in SMFL, CSLL). Mt. Trus Madi, 1100-1600 m, GP 383/99 SNB, BC 1888 SNB (CSNB, CWAN in SMFL, CSLL). Mt. Marapok (CSNB).

Malaysia, Peninsula: Cameron Highlands, 900 m (Lampe, 1984, 1985; CSNB); U. and L. H. Paukstadt (2004: 140-141; Ar. staudingeri is a “typical lowland taxon”). – Perak: 30 km E Gerik, 420 m (CSLL).

Ar. staudingeri ranges from about 300 to 1800 m elevation (both extremes observed on Sumatra: Nässig et al., 1996: 25-26; U. & L. H. Paukstadt 2009: 339). Observations took place in iii. in Borneo, vi.-x. in Sumatra, ix. in Perak. The tropical populations will probably be found at any time of the year, except during extended dry periods.

Ar. staudingeri was never seriously doubted as being a distinct species; the differences in external imaginal (and larval) morphology are quite clear. Our results based on DNA barcodes, reporting that the species is genetically closer to Ar. malayanus, were then rather unexpected.

Discussion

Although not supported by the collecting data at the lowest altitudes (which are very similar in all three taxa), the general trait attributed to Archaeoattacus edwardsii (including Ar. malayanus) of preferring higher elevations and Ar. staudingeri preferring lower elevations (U. & L. H. Paukstadt, 2004: 140-141) is probably correct when considering all the data for the many specimens observed, and when considering the highest elevation records at which these taxa have been recorded.

Considering the variation of DNA barcode sequences within each of the three species now recognized within the genus Archaeoattacus, it is now interesting to observe a peculiar geographic structure shared by Ar. malayanus and Ar. staudingeri. The few samples sequenced from the Malay Peninsula (in the case of Ar. malayanus, including also the Isthmus of Kra, Thailand, Ranong prov.; we do not yet have barcode data for the specimen from Myanmar, Tenasserim) diverge significantly from those of other conspecific populations (up to 2% and 1.7% within Ar. malayanus
and *Ar. staudingeri*, respectively). There is no evidence that such divergence reflects an actual separation of lineages deserving a particular taxonomic status, but it is very interesting to observe that in both cases, the divergence occurs in the region where the two species live in sympatry. Further sampling would be necessary to confirm this pattern. The observed divergence may be caused by some degree of geographical isolation of populations inhabiting the Malay Peninsula, or alternatively we may be observing an interesting case of incipient speciation driven by reinforcing natural selection in the contact zone between the two species (Hoskin et al., 2005).

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