Supplementary material 1. Documentation on phylogeny. Documentation used to assemble the branching pattern of the cladogram for the species included in the study.

The phylogenetic relations were adapted from the results published by many researchers. Not being a central part of the present study, this information is perhaps too long to be included in the main references. However, these advances are essential for the understanding of Lepidopteran and should be specifically acknowledged. The tree structure was not updated after January 2023, with the result that some later publications were not used, e.g. Condamine et al. (2023), Boyle et al. (2023), Huang et al. (2024), Li et al. (2023), Murillo-Ramos et al. (2023) or Nedumpally et al. (2024). The tree topology used in García-Barros (2015) was used as the starting point; the references quoted there (García-Barros 2015: Supplementary material 3) are not repeated here unless necessary.

The basal structure and the relationships between the superfamilies were composed following Regier et al. (2015), Heikkilä et al. (2015), Bazinet et al. (2017) and Kawahara et al. (2019). Only three *Micropterix* spp and one species of *Eriocrania* were represented in the data so this part did not require much edition. Within the remaining basal-most groups and as far as possible, the relations within Nepticuloidea were derived from van Nieukerken et al. (2016) and Doorenweld et al. (2017). For the Hepialidae Grehan et al. (2012) and Brown et al. (2001) were used for the "oriental genera", the remaining genera remain largely unresolved (as far as possible, based on Grehan et al. 2012 and Regier et al. 2015).

Tineoidea: main structure from Regier et al (2015) with some details from Mitter et al. (2017). The basal branches from Yponomeutoidea to the Obtectomera (including Choreutoidea, Urodoidea, Tortricopidea, Sesioidea and Cossoidea) represent a consensus from Bazinet et al. (2013) and Kawahara et al. (2019) with the Yponomeutid and Gracillarioid structures following Sohn et al. (2013) and Kawahara et al. (2011, 2017); the genus *Yponomeuta* was partly resolved after Turner et al. (2010).

The relationships between Cossoidea, Sesioidea and Zygaenoidea were left unresolved (Kaila et al. 2015, Mayer et al. 2021). Cossoid families were arranged after Bazinet et al. (2013) and Kawahara et al. (2019) but with the Ratardiidae/inae and Metarbelidae/inae placed as additional branches of a basal politomy (as they were not included in those). In addition, for the Cossidae: Schoorl (1990) and Davies et al. (2008); Moraes and Duarte (2014) for Castniidae (though the castniid generic names have not been updated). For the Sesiidae, namely Lait and Hebert (2018) but some details after McKern et al. (2009) and Bartsch et al. (2021); the Tinthiinae placed in a trichotomy together with the tribes Melittini and Synanthedonini. The general structure of the Zygaenoidea represents a combination of the results by Yen et al. (2005), Niehuis et al. (2006) and Regier et al. (2013) (since none of the sources dealt with all the families). For the Zygaenidae Chalcosiinae, Yen et al. (2005) is the reference; some information from Niehuis et al. (2007) on *Zygaena* was incorporated. The family Limacodidae was left largely unresolved, in part due to the non-specific identification of one part of the species; I partly adopted Lin et al. (2019) with additional elements from Solovyev (2014) and based in the nomenclatural arrangement in Holloway (1986).

The few genera of Choreutidae represented in the dataset were sorted following Rota and Wahlberg (2012) and Rota and Miller (2013), and the Tortricoids (basically, Tortricidae) after Regier et al (2012) with minor modifications for Archipini (from Dombrosky and Sperling, 2012, 2013) and Eucosmiini (from Gilligan et al. 2014).

The Papilionoidea are, of course, the most thoroughly worked out group and probably not all the relevant information was covered. Adopting the family-level relations quoted above, the Papilionidae subfamilies and tribes were organized after Simonsen et al (2011) and Joshi and Kunte (2022) for *Papilio* and Zao et al. (2022) for *Parnassius*, and from the coincident structures in Hancock (2007) and Miga et al. (2021) for Troidini. For the tribes Graphiini and Lampropterini I

adopted Wilson et al. (2014) and Wu et al. (2015) with the positions of a few species after Makita et al. (2003) and *Graphium mandarinus* and *G. leechi* placed after Hu et al. (2019). The structure for the genus *Papilio* was composite from the results by Zakharov et al. (2004), Miga et al. (2021) and Joshi and Kunte (2022).

The basal branching of the Hesperiidae follows: Warren (2009) and Li et al. (2019). The relationships within the subfamily Eudaminae are after Li et al. (2019; but with *Chrysoplectum*, of uncertain position, placed in the basal node), and the Hesperiinae the tribe Baorini following Fan et al. (2016). For the Carcharodini: Zhang et al 2020, the relationships in *Burnsius* and *Heliopetes* based in Zhang et al. 2022. Wiemers et al. (2020; for the European taxa) was adopted when possible.

The Lycaenidae + Riodinidae clade was drawn from a consensus between Espeland et al. (2018) and Seraphim et al. (2018) with the Nemeobiinae tribes after Espeland et al. (2015). Again, Espeland et al. (2018) was used for the basal structure within the Lycaenidae, with some details adapted from Wiemers et al. (2020), Robbins (2022, for the Eumaeini), Stradomsky (2016) (for *Udara* and *Oboroma*) and Talavera et al. (2013) for *Icaricia*. *Zizula* was intuitively placed following Clench (1965).

The Nymphalidae have the structure proposed by Espeland et al. (2018) with some slight modifications for the Libytheinae (from Kawahara 2009), Danainae (from Brower et al. 2010, 2014, and Chazot et al. 2019). Within this last group, the arrangement of the Acraeini and Heliconiini followed Brower et al. (2006), Silva-Brandão et al. (2008) and Kozak et al. (2015); also, Shi et al. (2015) for the location of *Dichorragia* (Pseudargolinae). The main sources for the remaining Nymphalidae were Wu et al. (2019), Min et al. (2011) (Limenitidini); Oshima et al. (2010) (Apaturinae), Long et al. (2014) Wahlberg and Rubinoff (2009, 2011), Fric et al. (2022) (Nymphalinae, Cyresthinae); and Toussaint et al. (2015, 2019) Wahlberg and Brower (2024) (in addition to Aduse-Poku et al. 2009, Ortiz-Azevedo and Willmott 2013 and Ortiz-Azevedo et al. 2017) for the Charaxinae. The scheme for the Morphini and Brassolini was completed from Freitas and Brown (2004), Penz (2008) and Cassildé et al. (2012) while Penz 2021 and Chazot et al. (2021) provided additional information on the Amathusiini, Elymniini and Haeterini (Satyrinae). Further details for the Satyrinae were extracted from Marín et al. (2010), Nazari et al. (2010), Peña et al. (2010), Yang and Zhang (2015) and Wiemers et al. (2020).

The basal relations of the Gelechioid families were derived from Wang and Li (2020) with conservative resolution, in consensus with Heikkilä et al (2014) and former studies (e.g. Kaila et al. 2011) when feasible. The family Gelechiidae mainly reflects the topology in Karsholt et al. (2013) with some genera placed after Ponomarenko (2006) and Lee and Brown (2008, for Litini (Gelechiinae). The arrangement of the Ethmiidae is from Wei et al. (2007) and Mey and Shovkoon (2014).

For the Pterophoridae, the tree is partly based in the morphological approach by Alipanah et al. (2011). The relations within Thyridoidea and Calliduloidea, poorly represented here, were left largely unresolved (as in Kristensen et al. 2007) with branching representing the formal generic classification.

The position of the Pyraloidea is from Kawahara et al. (2019) with the Hyblaeoidea as the sister group (Twort et al. 2020, Regier et al. 2012) with large groups relations after Regier et al. (2012), especially Lèger et al. (2021: Crambidae), and the internal relations of the Pyralidae after the basically coincident results from by Solis and Mitter (1992) and Regier et al. (2012) and some improvement from Mally et al. (2019) for Crambidae (and the position of Syllepte from Matsui et al. 2022).

Mimallonidae were arranged after St Laurent and Kawahara (2019) and the Drepanoid basal relations after Wu et al. (2010) though this taxon remained largely unresolved.

For the large Noctuoidea, the general scheme was constructed following Zahiri et al. (2011, 2012) and Kawahara and Breinholt (2014; except for the Noctuidae) in addition to: Regier et al. (2017) combined with Zahiri et al. (2010) for Notodontidae, Zahiri et al. (2013) for the Nolidae (but with a few species attributed to Afridinae and Camptolominae placed intuitively) and Zahiri et al. (2023) for Euteliidae (except *Caligatus* not included in that study, here arbitrarily placed at the base of Euteliinae). The Noctuidae: largely following Keagan et al. (2021) with Rota et al. (2016) for the Acronictinae genera.

The basal relations of Erebidae are a conservative consensus based in Regier et al. (2017), especially Zahiri (2011, 2012). Wang et al. (2015) was taken as the reference for Lymantriinae. While the detailed structure of the Erebids remains to be solved at many points, information on Arctiinae was incorporated from Zaspel et al. (2014) and Zenker et al. (2018) with additional branching patterns for the Arctiini: Arctiina (from Rönkä et al. 2016) and Lithosiini (from Scott et al. 2014), and some details on the Callimorphina (Arctiini) from DaCosta and Weller (2005) and DaCosta (2010). The relations among the genera of Phaegopterini were based in DaCosta et al. (2006); and those in the Syntomini were derived from Prybilovcz et al. (2019).

The superfamily Bombycoidea (formally including or not the Lasiocampidae, in any case the sister taxon to the remaining families) was resolved basally after Zwick et al. (2011) updated from Kawahara et al (2019) and Wang et al. 2019 (virtually in agreement) and minor changes after Hamilton et al. (2019). Within this scheme, Mitter et al. (2000) and Zolothunin et al. (2012) were followed for the family Lasiocampidae; Wang et al. (2019) and Deng et al. (2022) for the Bombycidae.

The general branching pattern in the Saturniidae derived from Regier et al. (2008) updated from Hamilton et al. (2019, 2022) and Rougerie et al. (2022). Some details for specific genera were incorporated from Rubinoff and Sperling (2002), Rubinoff et al. (2017) and Nethavhani et al. (2022).

The Sphingidae were arranged after the results by Kawahara et al. (2009) and Hamilton et al. (2019) in addition to those from Timmermans et al. (2019; for the Smerinthinae: Ambulacini).

The basal relations of the Sematuridae, Epicopeiidae and Uraniidae followed Kawahara et al. (2019), Murillo-Ramos et al. (2019) and Mayer et al. (2021), with more detailed information on the Uraniidae from Nazari (2016).

The subfamily level branching pattern of the Geometridae was taken from Sihvonen et al. (2011), Murillo-Ramos et al. (2019) and Brehm et al. (2019). Further details for the Sterrhinae were obtained from Sihvonen et al. (2020), and for the Larentiinae from Ounap et al. (2016) (also from Brehm et al. 2019).

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