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An annotated catalog of fossil and subfossil Lepidoptera (Insecta: Holometabola) of the world

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Abstract

In this catalog, we attempt to assemble all fossil records of Lepidoptera described formally or informally in the world literature. A total of 667 records dealing with at least 4,568 specimens have been compiled. They include descriptions of 131 fossil genera and 229 fossil species, as well as 72 extant genera and 21 extant species to which some of these fossils supposedly belong or show superficial similarity. Replacement names of two fossil genera are proposed to avoid homonymy: *Baltopsyche* Sohn, **gen. nov.** for *Palaeopsyche* Sobczyk and Kobbert, 2009 and *Netoxena* Sohn, **gen. nov.** for *Xena* Martins-Neto, 1999. New generic combinations are proposed for: *Tortrix?* *destructus* Cockerell, 1916, *Tortrix florissantanus* Cockerell, 1907, and *Tortrix* sp. sensu Gravenhorst (1835), all three to *Torticites* Kozlov, 1988; *Pterophorus oligocenicus* Bigot, Nel and Nel, 1986, to *Merrifieldia* Tutt, 1905; *Aporia* sp. sensu Branscheid (1969) to *Pierites* Heer, 1849; *Noctua* spp. sensu Hope (1836) and Lomnicki (1894), both to *Noctuites* Heer, 1849. Eleven names improperly proposed for lepidopteran fossils are invalidated: *Baltonides roeselliformis* Skalski in Kosmowska-Ceranowicz and Popiolek, 1981; *Baltodines* Kupryjanowicz, 2001; *Barbarothea* Scudder, 1890; *Lepidopterites* Piton, 1936; *Palaeozygaena* Reiss, 1936; *Psamateia calipsa* Martins-Neto, 2002; *Saxibatinca meyi* Skalski in Kristensen and Skalski, 1998; *Spatialistiforma submerga* Skalski, 1976; *Thanatites juvenalis* Scudder, 1875; *Torticibaltia diakonoffi* Skalski, 1976; and *Zygaenites* Reiss, 1936. An unnecessary subsequent type designation for *Pierites* Heer, 1849, is discussed. A total of 129 records include lepidopteran fossils which cannot be placed in any taxonomic rank. There also exist at least 25 fossil records which lack any evidence of the supposed lepidopteran association. Misidentified specimens, including 18 fossil genera, 29 fossil species and 12 unnamed fossils, are excluded from Lepidoptera. All the known lepidopteran fossils are annotated by fossil type, specimen deposition, excavation locality, association with plants when present, and geological age. A bibliographic list of lepidopteran fossils is provided.

Key words: Nomenclature, paleobiodiversity, paleontology, plant-insect interactions, taxonomy.

Introduction

Fossils provide the most direct window on ancestral lineages and their morphological character states (Hermsen and Hendricks 2007; Cobbett *et al.* 2007) and play an especially important role in tracing the evolutionary history of organisms not represented in the extant fauna. As molecular dating analyses have become common in the last decade (Drummond *et al.* 2006), the value of fossils in evolutionary studies has increased measurably, attributable to their role of providing calibration points for estimating divergence times. Confident dating requires multiple fossils (the more the better; see Pyron 2010) which are securely identified and of appropriate age. However, the availability of such fossils is strongly taxon-dependent.

While the Lepidoptera are one of the so-called “Big Four” insect orders in extant species diversity (Grimaldi and Engel 2005), their fossil record is proportionally very sparse (Kapoor 1981; Labandeira and Sepkoski 1993). Kristensen and Skalski (1998) estimated that only 600–700 total fossil specimens of lepidopterans are known. Taphonomic simulations with extant species suggest that the fragility and buoyancy of the body and wings of Lepidoptera make them especially unlikely to be preserved in lacustrine fossil beds (Duncan 1997), compared to other insect groups. Probably for this reason, amber inclusions and trace fossils such as leaf mines constitute the majority of fossil evidence for Lepidoptera (Skalski 1976a; Kristensen and Skalski 1998; Grimaldi and Engel