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Revision of the *Xylophanes libya* (Druce, 1878) species group, with the description of four new species from Central and South America (Lepidoptera, Sphingidae, Macroglossinae)

Jean Haxaire[1] & Tomas Melichar[2] & Ian J. Kitching[3]

[1]SMCR (Sphingidae Museum of Czech Republic), correspondent of the MNHN, Paris. « Le Roc », F47310 Laplume, France. ORCID Id: https://orcid.org/0000-0001-6375-3892, jeanhaxaire@gmail.com
[2]SMCR (Sphingidae Museum of Czech Republic), Orlov 79, 26101, Příbram, Czech Republic. sph.melichar@seznam.cz
[3]Science Group, Natural History Museum, Cromwell Road, London SW7 5BD, U.K. ORCID Id: https://orcid.org/0000-0003-4738-5967, i.kitching@nhm.ac.uk
urn:lsid:zoobank.org:pub:0D9ACC7A-0DE2-4711-9CFE--10A4B1711FB3

Summary
The authors clarify the status of the species *Xylophanes libya* (Druce, 1878). They demonstrate that what is currently referred to by this name is in fact a complex of seven, genetically well-isolated species. The study is based on an extensive campaign of museological and field prospecting, supplemented by dissections of male genitalia and DNA barcoding of specimens in their collections. *Xylophanes libya* is redescribed and its distribution clarified. *Xylophanes pallescens* Closs, 1917 **stat. rev.** is removed from synonymy with *Xylophanes libya* and revalidated as a good species. Four new species are described: *Xylophanes faixi* Haxaire & Melichar **sp. n.** from the Pacific coast of northern and central Mexico, *Xylophanes campisi* Haxaire & Melichar **sp. n.** from central Mexico to Costa Rica, *Xylophanes nehamiai* Haxaire & Melichar **sp. n.** from Costa Rica and northwestern Venezuela, and *Xylophanes confusa* Haxaire & Melichar **sp. n.** from Costa Rica and Panama.

Résumé
Les auteurs clarifient le statut de l'espèce *Xylophanes libya* (Druce, 1878). Ils démontrent que ce que l'on désigne sous ce nom est en fait un complexe de sept espèces, génétiquement bien isolées. L'étude repose sur une vaste campagne de prospection muséologique et de terrain, mais aussi de dissections et de Barcoding d'exemplaires de nos collections. *Xylophanes libya* est re-décrit et sa répartition précisée. L'espèce *Xylophanes pallescens* Closs, 1917 **stat. rev.** synonymisée avec *Xylophanes libya* est revalidée au rang de bonne espèce. 4 nouvelles espèces sont décrites : *Xylophanes faixi* Haxaire & Melichar **sp. n.** de la côte pacifique du nord et centre Mexique, *Xylophanes campisi* Haxaire & Melichar **sp. n.** du centre du Mexique au Costa Rica, *Xylophanes nehamiai* Haxaire & Melichar **sp. n.** du Costa Rica et nord-ouest Venezuela et *Xylophanes confusa* Haxaire & Melichar **sp. n.** du Costa Rica et du Panama.

The taxonomic history of *Xylophanes libya* (Druce, 1878)

In 1878, in a short note of only two pages, the English entomologist Herbert Druce described six new species of Neotropical Sphingidae, including *Choerocampa libya* Druce, 1878 (Fig. 1). As also mentioned by Kitching (2023), the lectotype, from Chiriquí, Panama, was designated and illustrated by Haxaire (2018: 89) (Fig. 2a-b).

Later, Druce, in the *Biologia Centrali-Americana* (Druce, 1881: 9), noted observable variation within his species, pointing to an excellent character, the colour of the central band of the hindwing upperside of a specimen from Nicaragua, which he said "differs from the type, the orange band of the posterior wing being slightly narrower and more clouded with black".

CHŒROCAMPA LIBYA, n. sp.

Closely allied to *C. Lælia*; the primaries darker brown, crossed by seven dark lines. Secondaries black, crossed from the anal angle to near the apex by a band of reddish-brown. Under-side reddish-brown, darkest at the base of primaries; a submarginal row of black spots crossing both wings, the outer margins pale brown. Abdomen dark brown, paler on the under-side; three indistinct lines down the middle on the upper-side. Exp. 3 inch.

Hab.: Chiriqui (Arcé). Mus. Druce.

Figure 1
Original description of *Xylophanes libya*.

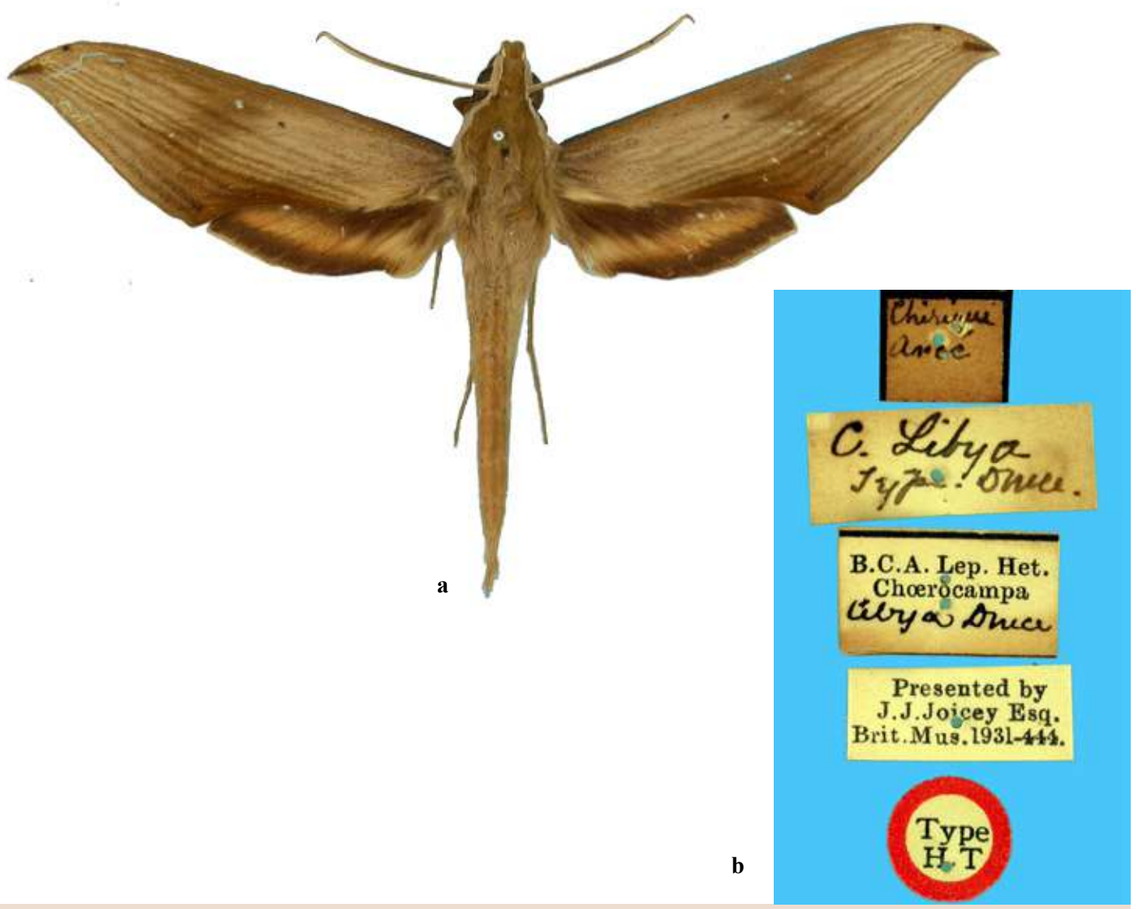

Figure 2
Xylophanes libya, lectotype, male © NHMUK. a- male specimen. b- labels of the specimen.

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Twenty years later, Schaus (1898: 135) synonymized *Choerocampa libya* with the southeastern Brazilian species, *Xylophanes aglaor* (Boisduval, 1875), a decision that was not entirely illogical as the two insects do have a certain superficial resemblance, especially in the shape of the forewings. This similarity was heightened by the illustration published by Druce (1881, plate 2 fig. 5) of *Choerocampa libya*, which is visibly stylized and evokes even more clearly the Brazilian insect.

However, the revalidation of *Choerocampa libya* was not long in coming. Rothschild & Jordan (1903: 709) reinstated it in their *Revision* and placed it in their new genus, *Xylophanes*, correctly noting that *Xylophanes libya* is not present in Brazil. They re-described the species and illustrated the apex of the phallus by means of a line drawing of its male genitalia (plate 57, figure 23), based on either one or a combination of two "dry-dissected" specimens now held in the NHMUK from Orizaba, Mexico. The given distribution of the species was immense: "Neotropical Region: Mexico to Peru and Surinam". We will return below to a consideration of this last-mentioned country.

Fifteen years later, Closs (1917: 134) described a closely related species, *Xylophanus* [sic] *pallescens* from an unspecified number of specimens from Pozuzo, Peru. He compared his new species with *Xylophanes libya*, pointing out that the differences were slight but consistent, emphasizing that the appearance of the oblique lines on the forewing upperside were "more uniform" and that the underside of the hindwing had only a single transverse line. We examined a female specimen labelled as "Holotypus" in the ZSM and in the interests of nomenclatural stability, we here designate it as the lectotype (Figure 3).

Draudt, in Seitz (1931: 895) synonymized Closs's species with *Xylophanes libya*, treating it as a simple individual form and justifying the synonymy as follows: "*pallescens* Closs, according to Gehlen who possesses the type, is a slight deviation with more uniformly brown lines and a darker under surface, hindwing with but one broad discal band beneath".

Xylophanes pallescens was, apparently unintentionally, revalidated as a species by Bridges (1993) in his catalogue. Bridges appears to have been unaware of Draudt's decisi-

Figure 3
Xylophanes pallescens, lectotype female, ZSM © Jean Haxaire.

on, since he does not mention this status of "form" in the "Species-Group Names" section on page VII.59, nor in his Index to Genera Species-Group Names, where the insect is simply listed as a good species (VIII.26). Likewise without any explicit validation, and probably also unintentionally, *Xylophanes pallescens* was resynonymized with *Xylophanes libya* by Carcasson & Heppner (1996: 59) in their *Atlas of Neotropical Lepidoptera*. This decision was endorsed by Kitching & Cadiou (2000: 72) in their *Checklist*.

Thus, at the time of writing, *Xylophanes libya* has only one synonym, *Xylophanes pallescens*.

***Xylophanes libya*, a species complex**

In more than 30 years of surveys, we have amassed over 2500 specimens that we identified as *X. libya*, from Mexico, Guatemala, Nicaragua, Costa Rica, Panama, Colombia, Venezuela, Ecuador, Peru and Bolivia. However, it quickly became clear to us that *libya* was a mix of species, only some of which were easy to separate on habitus.

It was impossible for us to be satisfied with that situation. Even if the Andean insect seemed relatively well-circumscribed, it did not resemble the type of *libya*. Furthermore, the "*libya*" that we had from western Ecuador, dark with more falcate wings, were unambiguously isolated from those present on the Ea stern slope of the Andes and for us deserved description (we had not yet then worked on the type of *libya*). But in Mexico and Central America, the situation was even worse, with everything with the same general habitus that was not *X. loelia* (Druce, 1878) classified as *Xylophanes libya*. We separated these two groups based on hindwing pattern; in *loelia*, the medial pinkish band reaches the (strongly protruding) apex of the wing, whereas in all the supposed *libya*, this band is surrounded by black, including at the (more rounded) apex. This is the criterion we used in Venezuela when we encountered these Sphingidae in the states of Tachira and Carabobo.

The decision to revise this complex was made following the description of *Xylophanes yuliyae* Haxaire, 2018. Specimens of this taxon were so markedly different from the remaining "*libya*" that separating them out was easy. We had here an insect that in overall shape looked more like *Xylophanes maculator* (Boisduval, 1875) than *libya* and genetic analysis using DNA barcoding confirmed what was already obvious. For the remaining specimens, we began by undertaking a provisional separation on habitus criteria to create rather arbitrary groups before then undertaking a long campaign of dissection and DNA barcoding that lasted several years. At the same time, that there were still unrecognized species-level taxa included under the name *libya* was also suggested by Professor Dan Janzen and his team as a result of their extensive analysis of "*libya*" based on DNA barcode analysis of numerous Costa Rican specimens. From these results, six distinct BINs emerged unambiguously (not counting *X. yuliyae*).

Once the lectotype of *libya* had been correctly associated with one of these BINs (see below), and the name *pallescens* with a second, it remained to characterize the other four clusters, all of which we consider constitute species new to science. Our conclusions are as follows:

-As already mentioned above, the first and easiest species to recognize, on both the shape of the wings and the habitus, is the recently described *Xylophanes yuliyae.* It is known from southern Mexico (Chiapas) to Costa Rica, and we have it from Guatemala and Nicaragua. It needs neither dissection nor DNA barcoding to be recognized.

-The species that occurs in the Andes, in Ecuador, Peru and Bolivia, and is also easily and indisputably separable, is *Xylophanes pallescens* **stat. rev.**

-The third species is the insect occurring on the Pacific coast of Ecuador (Occidente) that had struck us by its darker appearance and strongly falcate forewings. The structure of the male genitalia is also distinctive. Initially, we considered that this would be an undescribed species, until we studied the genital dissection of the lectotype of *X. libya*. This confirmed that the Western Ecuador moth was the "real" *libya*. Everything fitted, and even if the habitus of the lectotype seems less darkened (probably due to fading with age), the shape of the wings agrees exactly and this shape is unique. We will return to the characters that guided our choice in the species accounts below.

-In northern and central Mexico, west of the Sierra Madre Occidental, is a fourth, undescribed species. It is more reminiscent of *X. loelia* but its genital structure is closer to that of the *libya* group. This species is found from Nayarit to Oaxaca, along the Pacific coast, and is described below.

-In the rest of Mexico (San Luis Potosi, Veracruz, Quintana Roo, Chiapas), Nicaragua and Costa Rica flies a fifth species that is quite close to the previous but which we have distinguished on some points of the habitus, and especially the male genitalia. It is also a new species, which we describe below.

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-In Venezuela and Costa Rica, and most likely also in Panama, there is a sixth species that resembles the previous entity but is larger with wider wings and different genital structures. This is also a new species and we describe it below.

-Finally, from Costa Rica, there is an insect that caused us many problems but which was the key to the whole problem. It is close to *X. libya* in habitus, but with a slightly different wing shape. It is also relatively similar to insects from north and central Mexico (Pacific coast) in genital morphology but is completely different in habitus. We long considered that this was Druce's *Xylophanes libya*, and even illustrated it as such in the description of *Xylophanes yuliyae* (Haxaire, 2018: 97, figure 3). However, a thorough study of the habitus and genitalia of the lectotype of *X. libya* and a detailed comparison with more than 50 specimens from Panama, Colombia and western Ecuador showed us that we were wrong. *Xylophanes libya* is indeed the taxon from Colombia / Ecuador, and that which is currently endemic to Costa Rica belongs to an undescribed species.

The seven species of the *libya* complex

Abbreviations

CJHL: Collection of Jean Haxaire, Laplume, France
Gen: genitalia preparation
NHMUK: Natural History Museum, London, UK
OC: original combination
RFWL: right forewing length (from base to apex)
SMCR: Sphingidae Museum, Orlov, Czech Republic
TL: type locality
ZSM: Zoologische Staatssammlung München, Munich, Germany.

Methods

Genitalia images were taken with a Canon Eos R on a Leica stereomicroscope. Adult images were taken with a Canon Eos R with an EFS 60mm macro lens and a macro twin lite MT 24 EX Canon flash.
Selected specimens from our collections were subjected to DNA barcode analysis, using short sequences corresponding to the COI mitochondrial gene via BOLD (Barcode of Life Data System, < www.boldsystems.org >) (Ratnasingham & Hebert, 2007). Sequences were aligned using the BOLD Aligner (Amino Acid Based HMM), then analyzed and a neighbor-joining tree generated using the tools provided in BOLD. Average sequence divergences between barcode sequences were calculated using the Kimura K2 Parameter (Kimura, 1980).

In the species descriptions that follow, we will often refer to the apical plate on the tip of the phallus, the anatomical structure that bears most of the distinctive characters. As always in *Xylophanes*, these differences are on the one hand very subtle and on the other hand relatively variable. We will therefore talk about trends and averages, even if this may seem frustrating. This apical plate is a sclerotized bar on the left side of the phallus and runs for two millimeters along the phallus. Its surface bears numerous small thorns and ends distally with a process that curves to the right, is smooth along its distal (posterior) edge, and is armed with small teeth along its anterior margin. The degree of curvature and dentition provide excellent diagnostic criteria. We will refer to these two parts of the apical plate as the "left process" and the "right process".

Xylophanes libya Druce, 1778 (Plates 5e-h, 6a-h & 11a-f)
OC: *Choerocampa libya*
TL: [Panama:] Chiriqui [Chiriquí], [leg.] Arcé [NHMUK] (type examined)

The lectotype (Fig. 2 a-b, Plate 6, fig. e, f, g & h) was designated by Haxaire (2018).
In our collections, the average wingspan of the males is 80 mm, with extreme values of 78 and 82.5mm.
Xylophanes libya is one of the easiest to recognize. The forewing is relatively narrow, elongate and has a rather falcate and pointed apex that is highlighted by a short, black dash that is more accentuated than in all other species. In addition, it is darkened in the medial area, especially distal to the discal spot. These features serve to distinguish *libya* from the other species with which it cohabits. The hindwing has a pinkish-beige medial band that is sprinkled with black scales. This band is narrow and almost never reaches or passes vein Rs.
In the male genitalia, the most striking feature is the vestigial harpe, which is flattened like a shark's tooth and quite clearly rises upwards. It is not curved and one can barely distinguish the sacculus from which it derives. Also, it does not seem to be terminal, but sub-terminal. We found this unique harpe shape, which is also that seen in the lectotype of *libya*, in several of our specimens from Western Ecuador (Cañar) and is the reason we decide to assign them to this species.
The left process of the apical plate of the phallus is weakly toothed but the distal margin always has two to four prominent teeth. The right process is strongly recurved through about 180°, so that its apex is directed along the line of the anterior edge of the left process. It is of variable length and thickness with variable dentation along its anterior margin.
The uncus and gnathos are robust and thicker than in the closely related species described below as *X. confusa* **sp. n.**

Figure 4
Xylophanes libya, from Ecuador, CJHL © Jean Haxaire. a- male.

Distribution. *Xylophanes libya* is currently known from the type locality (Panama, Chiriquí) to which we can add a second specimen, also from Panama, Chiriquí, Fortuna Forest Reserve, 3 IX 2016, leg. Benoit Vincent. This latter specimen played a key role in our study because it conforms to the lectotype. We have also obtained the species from western Colombia (Cali) and western Ecuador (Azuay, Cañar). The citation of Suriname by Rothschild & Jordan (1903: 709) is either an error or the result if confusion with the related *X. loelia*, as none of the species of the *libya* complex occurs in the Guyanan region.

Xylophanes pallescens Closs, 1917 **stat. rev.** (Plates 4e-h, 5a-d, 13a-d & 14a-d)
OC : *Xylophanes pallescens*
TL : Peru: Pozuzo [ZSM] (type examined)
The lectotype is designated in the present paper (see above).

In our collections, the average wingspan of the males is 76mm, with extreme values of 74.5 and 79mm.

In habitus, *Xylophanes pallescens* **stat. rev.** is always rounder, less slender and smaller than *X. libya* and lacks a falcate apex to the forewing. It should be noted that the lectotype is a female, which further accentuates this character. The wings of the males are narrower and slenderer, a distinction typical within the genus *Xylophanes*.
In the male genitalia, the harpe is more terminal, being developed as an extension of the sacculus rather than originating dorsally. It is almost always thin and slightly curved, except for one of our specimens from Ecuador (Morona Santiago) in which it is reduced to a broad-based but nevertheless well curved tooth.
In comparison to *Xylophanes libya*, the left process of the phallus is very weakly toothed, including dorsally, and the

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Figure 4
Xylophanes libya, from Ecuador, CJHL © Jean Haxaire. b- female.

right process is generally s horter, less recurved (only about 135°) and less dentate ventrally, especially at its apex.

Xylophanes pallescens **stat. rev.** is the most well-represented species of the group in collections. It is extremely common throughout the Andes from Colombia to central Bolivia, at elevations between 300 and 2000m with peak abundance at around 1300m. It is currently not known from Argentina (Aguado et al., 2021) or from Paraguay (Smith et al., 2022).

Xylophanes yuliyae Haxaire, 2018 (Plates 2e-h, 3a-d & 10a-d)
OC : *Xylophanes yuliyae*
TL : Guatemala, Izabal, Finca Firmiza, Cerro Negro Norte, 15°22.749'N, 89°41.684'W, 3070ft, 16 v 2007, leg. Herbin/Laura/Monzon Sierra, n° barcoding BC-Hax4424 [CJHL].

Xylophanes yuliyae is characterized by its rather geometric shape, being short and rather "square" in appearance, with protruding and strongly falcate forewing apices. The most diagnostic feature is the almost perfectly straight forewing termen. In these respects, it evokes *Xylophanes maculator* (Boisduval, 1875) and as such is the only species in the group that can be identified with certainty in a mixed series of Central American insects.
In the male genitalia, the sacculus is wide, narrowing sharply into a very narrow and curved harpe. The left process of the phallus is long, curved and regularly, though relatively sparsely toothed. The right process is very short, strongly recurved through about 180°and only toothed apically.
We know *Xylophanes yuliyae* from southern Mexico (Chiapas), Guatemala (Izabal), Nicaragua (Bartola) and Costa Rica (Heredia, Limon). It is never common.

Figure 5
Xylophanes pallescens male, Bolivia, CJHL © Jean Haxaire.

Xylophanes **faixi** Haxaire & Melichar **sp. n.** (Plates 1a-f & 7a-f)

<urn:lsid:zoobank.org:act:699C107E-2961-4C99-8F-96-8C2D83DB509E>

Type material
Holotype ♂ (with the following labels separated by forward slashes): 1♂, HP6, Mexico, Guerrero, 30 VI 2008, route Atoyac-El Paraiso, Camino Puente El Chico, pk 0.8, N 17°19.506' W 100°15.060', 2953ft, leg. Jean Haxaire & Odile Paquit (white printed label) / génitalia n°586, Sphingidae Jean Haxaire (yellow printed label) / BC-Hax4650 (white printed label) / *Xylophanes faixi* n. sp. Haxaire & Melichar HOLOTYPE (red printed label) [CJHL].

Paratypes (in total 4♂♂): 1♂, HP6, Mexico, Guerre ro, 30 VI 2008, route Atoyac-El Paraiso, Camino Puente El Chico, pk 0.8, N 17°19.506' W 100°15.060', 2953ft, leg. Jean Haxaire & Odile Paquit / BC-Hax4646; 1♂, 31.07.92, Oaxaca, Mexico, route de Puerto Escondido à Oaxaca, Rio Salado, 5 km. N. Santa Rosa, 1250 m. leg. Jean Haxaire & Daniel Herbin / BC-Hax4647; 1♂, Mexique, Nayarit, Route Ruiz à Santa Cruz del Guaybel, km 16, 125m. 20/VII/1998, leg. Haxaire / génitalia n°579, Sphingidae Jean Haxaire / BC-Hax0778; 1 ♂, HP6, Mexico, Guerre ro, 30 VI 2008, route Atoyac-El Paraiso, Camino Puente El Chico, pk 0.8, N 17°19.506' W 100°15.060', 2953ft, leg. Jean Haxaire & Odile Paquit / génitalia n°578, Sphingidae Jean Haxaire / BC-Hax4640 [CJHL].

Description
♂: RFWL: 33 mm, giving a wingspan of 70mm. In our collections, the average wingspan is 72mm, with extreme values of 60 and 78mm.

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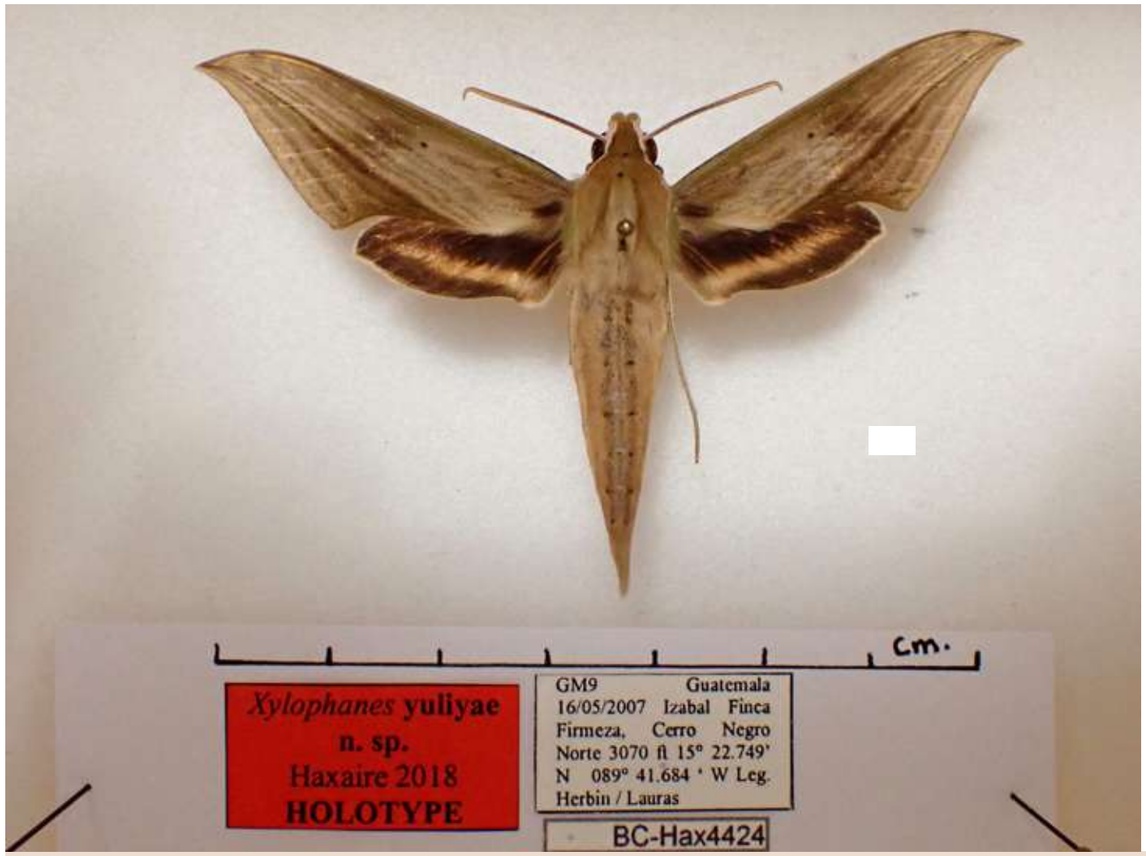

Figure 6
Xylophanes yuliyae, holotype, male CJHL © Jean Haxaire.

Upperside: Overall, a paler, low-contrast insect. Ground colour of head, thorax and abdomen beige-olive. Eyes circled with beige gray. Abdomen dorsally with three dorsal lines that are slightly darker than the ground colour. The flanks are a paler yellowish-beige colour.
Forewing ground colour also beige-olive. Distal to the discal spot, the wing is crossed by nine extremely narrow, parallel, oblique lines that run from the dorsum to the apex and are arranged in pairs. The first two are very close, of identical width but the first is darker and therefore stands out quite clearly. The next two are spaced slightly further apart. The fifth is the most accentuated and double the thickness of the others. The sixth line is narrower. Lines 7, 8 and 9 are located in the submarginal area. Between lines 2 and 5, the ground colour lightens to become beige-yellowish. The black apical spot seen in *X. libya* is lacking and the apex of the wing is pointed, but not falcate. The hindwing has the classic pinkish-yellow medial area. This area, finely sprinkled with black scales, is entirely surrounded by black, including at the apex. This apex is not very prominent.
Underside: Thorax and abdomen slightly pinkish grey; legs grey, the forelegs strongly narrowed distal to the tibiae. Wings yellow-orange, with the usual pattern of all "lined" *Xylophanes*. Forewing basal area greyish, becoming yellow-orange at the level of the first transverse line (this line not visible on the underside). The only notable feature is line 5, which is highlighted by a series of very conspicuous black vein dots; the costal dot is strongly accentuated. A grey oblique streak crosses the wing from the apex to vein M_3. Hindwing of the same pale yellow-orange hue. It is crossed by a greyish transverse shadow, followed by a yellow-orange medial area that is crossed, like the forewing, by a series of small black vein dots.

Figure 7
Xylophanes faixi **sp. n.**, holotype, male, CJHL © Jean Haxaire.

Male genitalia
Very poorly sclerotized, curiously soft and smaller than in the second Mexican species, *Xylophanes campisi* **sp. n.** (see below). Uncus and gnathos quite short, the former curved. Base of sacculus practically invisible, but the harpe is strongly developed, flat and well curved with an acute tip. The left process of the phallus very irregularly covered with spines of very variable size, sometimes grouped in clusters on a shared base. The right process projects almost laterally, at about 90°, and practically not curved. Except for two or three larger terminal teeth, it has small and closely placed and not very sharp teeth along its anterior margin.

Etymology
It is with great pleasure and all his gratitude that the first author dedicates this insect to Dr Antoine Faix (Montpellier, France) as a testimony to his great humanity, his listening and his exceptional skills.

Discussion
Xylophanes faixi **sp. n.** is currently known only from the Mexican states of Nayarit, Guerrero and Oaxaca. It is clearly another endemic species of the Pacific slope of the Sierra Madre Occidental, flying in arid and sparsely wooded biotopes at medium elevations. In general appearance, it is more similar to *Xylophanes loelia* than to *Xylophanes libya*. It can be separated from the latter by a very different wing shape, a paler colour, a less lined pattern and by the total absence of black spot at the apex of the forewing upperside. Nothing is known of its larval stages and host plants. The female is unknown to us.

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Xylophanes **campisi** Haxaire & Melichar **sp. n.** (Plates 1g-h, 2a-b & 8a-f)

<urn:lsid:zoobank.org:act:709E7A97-D77B-4885-BD-0D-BEEA74A8CBFE>

Type material
Holotype ♂ (with the following labels separated by forward slashes): Mexique, San Luis Potosi, Ciudad Del Maiz à El Naranjo, El Sabinito à El Aguacate, KM5, 435m. 27 VII 2000, 27.VII.2000, 22°29.449'N 99°21.970'W leg. Jean Haxaire & Odile Paquit / génitalia n°587, Sphingidae Jean Haxaire (yellow printed label) / BC-Hax0776 (white printed label) *Xylophanes campisi* n. sp. Haxaire & Melichar HOLOTYPE (red printed label) [CJHL].

Paratypes (in total 21♂♂)
1♂, Mexique, San Luis Potosi, Ciudad Del Maiz à El Naranjo, El Sabinito à El Aguacate, KM5, 435m. 27 VII 2000, 27.VII.2000, 22°29.449'N 99°21.970'W leg. Jean Haxaire & Odile Paquit / BC-Hax5238; 1♂ MX10, Mexique, San Luis Potosi, Rte Ciudad del Maiz-El Naranjo, piste El Sabinito-El Aguacate pk 5, 1427 ft, 22°29.449'N, 99°21.970'W, 27 Juillet 2000, leg. Haxaire-Paquit / BC-Hax4649; 1♂, Mexique, 7 août 2003, San Luis Potosi, Route allant de Ciudad del Maiz a El Naranjo, piste de Maguey del Oriente pk 1,1. GPS: N 22° 29.268' – W 99° 25.070'. 2829ft. leg. Haxaire-Paquit / BC-Hax0777; 1♂, 24 VII 84, UV, Veracruz, 950m, Tlapacoyan, Mexico, leg. Kirby Wolfe; 4♂♂, Mexique, Chiapas, Las Margaritas, Piste vers Chiapas Km 10, 1600m, 18 août 1992, leg. Jean Haxaire & Daniel Herbin / BC-Hax0772 and BC-Hax0773; 3♂♂, Mexique, Chiapas, Route Ocosingo à Palenque, Piste vers Salto de Agua, 50m. Km 10, 21 août 1992. Jean Haxaire & Daniel Herbin / BC-Hax0774 and BC-Hax5236; 2♂♂, Mexique, Campeche, Calakmul, 15-28 X 2017 à la lumière, don de Stéphane Letirant / BC-Hax5239; 1♂, GM17, Guatemala Zacapa, 24/05/2007, Sierra de Las Minas. San Lorenzo road, 1857ft., 15°02.636'N 089°40.123'W leg. Herbin-Lauras / BC-Hax5237; 1 ♂, GA11, Guatemala, 21 VII 2004, département de Izabal, piste de Chocchoc à Cebol (Cevol) pk 2, Pueblo Cadenas 76m, N : 15° 54.186' / W : 89° 16.070' leg. Haxaire-Paquit / BC-Hax4645; 1♂, GM13, Guatemala 20-21/05/2007, Peten, Reserva Ixpanpajul, 636ft., 16°52.388'N 089°48.873'W leg. Herbin-Lauras / BC-Hax4643; 1♂, 2GT1 Guatemala, Zacapa, P. N. Sierra de Las Minas, Santa Cruz à San Lorenzo 17 km, 1640m. 13 X 2014, 15°04'33''N 89°41'06''W leg. Barbut-Lévèque; 1♂, Guatemala, Prov. Quiché, Ilom 1100m. Coffee Plantation, 2 juin 2008, leg. J. Touroult; 1♂, Nicaragua, San Rafael del Norte, Piste Jinotega-Yali, 10 km avant Yali (Jinotega) Alt. 1250m. Drap. Foret sèche. 28 VII 2000, leg. Felis & Laguerre / BC-Hax5233; 1♂, Voucher. D.H. Janzen & W. Hallwachs, DB: http://janzen.sas.edu, Area de Conservation Guanacaste, Costa Rica, 91-SRNP-3047 / legs away for DNA (yellow printed label); 1♂, Voucher. D.H. Janzen & W. Hallwachs, DB: http://janzen.sas.edu, Area de Conservation Guanacaste, Costa Rica, 91-SRNP-2712 / legs away for DNA (yellow printed label) / génitalia n°580 Sphingidae Jean Haxaire [CJHL].

Description
♂: RFWL: 33.2 mm, giving a wingspan of 68.8mm. In our collections, the average wingspan is 72mm, with extreme values 65.5 and 77mm.

Upperside: Overall, a paler, low-contrast insect. Ground colour of head, thorax and abdomen sandy beige. Eyes circled with beige grey. Abdomen dorsally with three lines that are slightly darker than the ground colour, of which the two lateral lines have a small black dot at the base of each abdominal segment. The flanks are a paler, sandy yellow colour. Forewing ground colour also sandy beige, with a very subtle olive reflection. Distal to the discal spot, the wing is crossed by nine extremely narrow, parallel, oblique lines that run from the dorsum to the apex and are arranged in pairs. The first two are very close, of identical width but the first is darker and therefore stands out quite clearly. The next two are spaced slightly further apart. The fifth line is the most accentuated and double the thickness of the others. The sixth line is narrower and slightly curved. Line 7 fades quickly towards the apex, not reaching beyond vein M_3. Lines 8 and 9 are located in the submarginal area. Between lines 2 and 5, the ground colour lightens slightly, creating a transverse beige-yellowish band. There is no black apical spot and the apex of the wing is pointed. The hindwing has the pinkish-yellow medial area typical of the group, heavily sprinkled with black scales. This area is entirely surrounded by black, including at the apex. The fringe is pinkish, and clearly visible.
Underside: Thorax and abdomen slightly pinkish grey. The legs are grey, the forelegs strongly narrowed beyond the tibiae.
Wings yellow-orange, paler than in the previous species. Forewing basal area pale-grey. Line 5 present as a line of very conspicuous triangular black vein dots; the costal dot is strongly accentuated. Distal to these dots is a grey oblique streak that runs from just dorsal of vein M_3 to the apex. Hindwing the same pale yellow-orange hue and crossed by a very diffuse greyish transverse band, followed by a yellow medial area, which, like the forewing includes a line of small black vein dots. Submarginal area grey.

Figure 8
Xylophanes campisi **sp. n**., holotype, male, CJHL © Jean Haxaire.

Male genitalia
More strongly sclerotized and robust than the previous species. Uncus and gnathos longer and projecting more horizontally. The harpe is essentially identical to that of *Xylophanes faixi* **sp. n.** but less flattened, less curved and gradually narrowed from the apex of the sacculus. The left process of the phallus is strongly dentate; the right is strongly recurved and toothed on its anterior edge. This recurvature seems to be the best character to distinguish these two species.

Etymology
We name this species after our colleague and friend, Marcos Cesar Campis de Morro Agudo (Brazil, São Paulo), an eminent wildlife photographer who constantly amazes us with his images of Brazilian Sphingidae. May he find here the indication of our great gratitude and admiration.

Discussion
This species was first collected during the third Mexican mission of the first author, mainly in the state of San Luis Potosi. It already posed an identification problem at that time due to its great resemblance to certain specimens of *Xylophanes loelia*.
Xylophanes campisi **sp. n.** is very simple to separate from *X. libya*. It has a heavier appearance, with wider, more rounded wings. The brownish medial shade that crosses the forewing in *libya* is restricted to the costal region in *campisi* **sp. n.** There is also no apical black mark and the termen is more convex. As noted above, it is much more similar to *X. loelia,* from which it can be distinguished by the wider wings and a hindwing medial band that is entirely circled with black apically. In the male genitalia, *X. campisi* **sp. n.** can be separated from *X. faixi* **sp. n.** by the very strongly recurved right process of the phallus, which

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is apically directed back towards the base, whereas this same piece is recurved only by about 90° in *X. faixi* **sp. n**.
Xylophanes campisi **sp. n.** is extremely common in Mexico and we know it from the states of San Luis Potosi, Veracruz, Campeche and Chiapas. It also occurs in Guatemala (Peten, Zacapa, Izabal, Quiché), Nicaragua (San Raphael del Norte) and Costa Rica (Guanacaste).
In Mexico, it seems to completely replace *X. faixi* **sp. n**. on the eastern slopes of the Sierra Madre Occidental, but this needs to be verified by a broader sampling throughout the territory.
The species has been bred in Costa Rica on two representatives of the genus *Psychotria* (Rubiaceae), *P. horizontalis* and *P. nervosa*, as well as on another Rubiaceae, *Margaritopsis microdon* (Janzen, 2023). The female of the insect is unknown to us but has been obtained by Costa Rican breeders. It differs from the male only in its larger size and more rounded appearance, i.e., the usual typical differences between the sexes of species of *Xylophanes*.

Remarks
In his book, James P. Tuttle (2007: pl. 14, fig. 4) figured a specimen of this species Xilitla, San Luis Potosi, and it is an absolute copy of paratype BC-Hax0777. Blanchard & Knudson, (1985) reported a single specimen of *libya* from Texas (Bentsen Rio Grande State Park (Hidalgo County) that is most likely a specimen of *X. campisi* **sp. n.** If confirmed, then this species should be added to the fauna of the USA in place of *X. libya*.

Xylophanes **nehamiai** Haxaire & Melichar **sp. n.** (Plates 2c-f & 9a-d)

<urn:lsid:zoobank.org:act:D42FD9FA-4DBC-443D-85BC-326CA6D62799>

Type material
Holotype ♂ (with the following labels separated by forward slashes): Venezuela, le 4 VIII 1986, Etat du Tachira, Rio Frio, 400m., U.V. leg. Jean Haxaire, Sarah Haxaire & Patrick Bleuzen / génitalia n°589, Sphingidae Jean Haxaire (yellow printed label) / BC-Hax4642 (white printed label) / *Xylophanes nehamiai* n. sp. Haxaire & Melichar HOLOTYPE (red printed label) [CJHL].

Paratypes (in total 8 ♂♂): 1 ♂ Venezuela, le 4 VIII 1986, Etat du Tachira, Rio Frio, 400m., U.V. leg. Jean Haxaire, Sarah Haxaire & Patrick Bleuzen / génitalia n°582, Sphingidae Jean Haxaire / BC-Hax4641; 1 ♂ Venezuela, le 27 VII 1986, Etat du Carabobo, Vallée du Rio Borburata, U.V. leg. Jean Haxaire, Sarah Haxaire & Patrick Bleuzen [CJHL]. 1♂, Costa Rica, Guanacaste, Area de Concervation Guanacaste, Sector El Hacha, Sendero Tigre, 10.032, -85.526, 280m, 21-IX-2001, leg. Lucia Rios / 01-SRNP-10540 [University of Pennsylvania]; 1♂, Costa Rica, Guanacaste, Area de Concervation Guanacaste, Sector El Hacha, Sendero Bejuquilla, 11.03, -85.527, 280m, 27-XI-2001, leg. Lucia Rios / 01-SRNP-11436 [University of Pennsylvania]; 1♂, Costa Rica, Guanacaste, Area de Concervation Guanacaste, Sector El Hacha, Finca Araya, 11.015, -85.511, 295m, 26-X-2002, leg. Manuel Pereira / 02-SRNP-30048 [University of Pennsylvania]; 1♂, Costa Rica, Guanacaste, Area de Concervation Guanacaste, Sector Del Oro, Quebrada Romero, 11.005, -85.474, 490m, 09-VII-2004, leg. Roster Moraga / 04-SRNP-22430 [University of Pennsylvania]; 1♂, Costa Rica, Alajuela, Area de Concervation Guanacaste, Sector Rincon Rain Forest, Jabalina, Manta Pizote, 10.973, -85.315, 288m, 06-II-2008, leg. S. Rios & R. Franco / 08-SRNP-100639 [University of Pennsylvania]; 1♂, Costa Rica, Alajuela, Area de Concervation Guanacaste, Sector San Cristobal, Quebrada Garcia, 10.8607, -85.4256, 495m, 26-II-2012, / 11-SRNP-4552 [University of Pennsylvania];

Description
♂: RFWL: 37.5mm, giving a wingspan of 81.2mm. In our collections, the average wingspan is 79.4mm, with extreme values of 78.7 and 81.2mm. Thus, it is the larger of the two "*loelia* looking *libya*".

Upperside: A larger, darker insect with cleaner lines. Ground colour of the head, thorax and abdomen beige-olive. Eyes circled with grey. Abdomen dorsally with three dark lines of substantially similar thickness. The flanks are paler, turning pale beige.
Forewing ground colour also beige-olive. Distal to the discal spot the wing is crossed (as in the majority of *Xylophanes*, not only the *libya* group) by nine very narrow but clear oblique and parallel lines that run from the dorsum to the apex and are arranged in pairs. The most visible are lines 1 and 5. The first two lines are very closely spaced, of identical width but the first is darker and therefore stands out quite clearly. The next two are spaced slightly further apart. The fifth line is the strongest, double thickness of the others and slightly curved. The sixth is narrower. Lines 7, 8 and 9 are located in the submarginal area. Line 7 is vestigial, originating on the dorsum but stopping at vein CuA_1. The lightening of the ground colour between lines 2 and 5 is much less marked than in *X. faixi* **sp. n.** and *X. campisi* **sp. n.** The black apical spot that is present in *X. libya.* is lacking in *X. nehamiai* **sp. n.** The apex of the wing is pointed, but not falcate.

Figure 9
Xylophanes nehamiai **sp. n.**, holotype, male, CJHL © Jean Haxaire.

The hindwing has a greyish-pink medial area, finely sprinkled with black scales, that is entirely surrounded by black, including at the apex. The veins are clearly visible within this area, being covered with black scales. The apex is not very prominent.
Underside: Thorax and abdomen slightly pinkish grey. The legs are grey.
Wings yellow-orange, with the usual pattern of all "lined" *Xylophanes*. Forewing basal area greyish, becoming yellow-orange at the level of the first transverse line, which is present as a very conspicuous black line that stops before reaching the costa. Line 5 highlighted by a series of black vein dots, that nearest the costa being the most strongly marked. The grey oblique streak that crosses the wing from the apex to vein M_3 is present but strongly faded.
Hindwing ground colour of the same pale yellow-orange hue. It is crossed by a greyish transverse shadow, followed by a second line of the same colour. Beyond these, the wing is crossed, like the forewing, by a series of small black vein dots. The submarginal area is grey.

Male genitalia
Along with *X. yuliyae*, *X. nehamiai* **sp. n.** has the most robust genital armature of the group. The uncus and gnathos are longer than in *X. campisi* **sp. n.** but also narrower. The sacculus is well delineated, with parallel edges. It ends with the smallest harpe of the group, not very long and above all completely flattened and therefore wider. The left process of the phallus is strongly toothed, especially dorsally, much more so than in *X. libya* and *X. pallescens*, and even more than in *X. campisi* **sp. n.** The right process is strongly recurved and is close to that of the latter species.

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Etymology
With great emotion, the first author dedicates this new species to Dr Pierre Néhamia (Agen, France) in token of his gratitude for having, on the one hand, supported him through a painful period of his life, and for having most likely saved his life by operating on him. Meeting a person of such humanity and professionalism is rare.

Discussion
X. nehamiai **sp. n.** was first collected during one of the first Venezuelan missions of the first author, in 1986. At the time, he had already noticed the great size of his specimens, but this was during the time when everything in which the pink hindwing medial band was circled with black was called *X. libya* and so this Sphingidae was also identified as such. There is a beautiful series of this species in the splendid collection of the University of Maracay (Venezuela, Aragua), that was organized first by René Lichy, then by Francisco Fernández Yépez. It should be noted, although it is now a little forgotten, that Venezuelan entomology at the time was one of the most active in South America, and this exceptional collection was added to by many entomologists from all over the world visited the famous Resort (Ecological Station) of Rancho Grande (where the first author himself also stayed for more than five weeks).
We know this species from northwestern Venezuela and Costa Rica, but it is almost certain that it is also present in Colombia and Panama.

Xylophanes **confusa** Haxaire & Melichar **sp. n.** (Plates 3e-h, 4a-b & 12a-f)

<urn:lsid:zoobank.org:act:F917B798-906E-4517-B4EE--CFFC7161291A>

Type material
Holotype ♂ (with the following labels separated by forward slashes): 1♂, Costa Rica, (Cartago) Parc National Braulio Carillo, Quebrada Gonzales, Rte San José à Guapiles, 600m. 11 mai 2005, leg. Benoit Vincent & Jérome Barbut / génitalia n°572, Sphingidae Jean Haxaire (yellow printed label) / BC-Hax0775 (white printed label) *Xylophanes confusa* n. sp. Haxaire & Melichar HOLOTYPE (red printed label) [CJHL].

Paratypes (in total 5 ♂♂): 1♂, Costa Rica, (Cartago) Parc National Braulio Carillo, Quebrada Gonzales, Rte San José à Guapiles, 600m. 5 mai 2005, leg. Jérome Barbut / génitalia n°573, Sphingidae Jean Haxaire / BC-Hax4644; 1♂, Costa Rica, Pr. Cartago, Reserve La Marta, 13 septembre 2009, 750m., 09°47'00.76''N 83°41'20.13''W leg. Daniel Herbin; 1♂, Voucher. D.H. Janzen & W. Hallwachs, DB: http://janzen.sas.edu, Area de Conservation Guanacaste, Costa Rica, 02-SRNP-19249 / legs away for DNA (yellow printed label); 1♂, Voucher. D.H. Janzen & W. Hallwachs, DB: http://janzen.sas.edu, Area de Conservation Guanacaste, Costa Rica, 02-SRNP-19434 / legs away for DNA (yellow printed label) / génitalia n°558, Sphingidae Jean Haxaire [CJHL].
1♂, Panama, Chiriqui, Réserve Forestière Fortuna, Route de Gualaca à Chiriqui Grande, 35km, 02-IX-2016, 1070m, 08°46'37,5'' N 82°12'32,03'' W, leg. Benoit Vincent / RROU0462 [MNHN].

Description
♂: RFWL: 40.5 mm, giving a wingspan of 84mm. In our collections, the average wingspan is 82.3 mm, with extreme values of 80.5 and 84mm. It should be noted that the two specimens from Costa Rica provided to us by D.H. Janzen are reared and so their size would significantly lower the average. For this reason, we have not included them in this average.
The wild insect always seems to exceed 80mm.

Upperside: A very dark insect but much less contrasted than *X. libya.* Head, thorax and abdomen very dark olive--beige. Eyes circled with greenish-grey. Abdomen dorsally with three slightly darker longitudinal lines. The flanks are only very slightly paler.
Forewing also very darkened olive-beige. Distal to the discal spot the wing is crossed by nine very narrow but clear oblique lines that run from the dorsum to the apex. These lines do not seem grouped in pairs as they are in the other species. The first four are identical in width and the first does not stand out more conspicuously than the following three. The fifth line and sixth lines are the most accentuated, double the thickness of the others, the latter being more curved. Lines 7, 8 and 9 are located in the submarginal area, the 7th not running from the dorsum beyond vein CuA_1. Between lines 2 and 5, the ground colour does not lighten at all, the insect thus appearing more homogeneous in colour than the other species studied here. The black apical spot that characterizes *X. libya* is practically absent, being hardly visible. The apex of the wing is pointed, but not falcate.
The hindwing has a reddish-brown median band that is finely sprinkled with black scales, especially on the veins, and is entirely surrounded by black. The apex is not very prominent.
Underside: Thorax and abdomen pinkish grey; legs grey.
Wings orange, with brick-red tones. Forewing basal area very dark grey, becoming orange at the level of the extremely conspicuous, dark grey first transverse line. Line 5 hi-

Figure 10
Xylophanes confusa **sp. n**., holotype, male, CJHL © Jean Haxaire.

ghlighted by a series of very conspicuous black nerve dots; that nearest the costa much larger than the others. Submarginal area orange, highlighted by a grey band. A grey oblique streak crosses the wing from the apex to vein M_3.
Hindwing ground colour the same orange hue. It is crossed by two greyish transverse lines, followed by a yellow-orange medial area. As on the forewing, this area is crossed by a series of small black nerve dots and the costal point is very strongly accentuated. The submarginal area is grey.

Male genitalia
The uncus and gnathos are thinner than in *X. libya.* The sacculus is poorly sclerotized and ends in a short, rather rounded, almost tubular, and generally not very sharp harpe. The left process of the phallus is more elongate and less wide than in *X. libya* and, above all, the right process projects practically horizontally, being recurved just slightly more than 90° and not folded towards the base.

Etymology
We chose to name this species *confusa* because we long thought that it was the "real" *Xylophanes libya* of Druce. This was a mistake, as we demonstrated above. It is this insect that the first author illustrated as *libya* (for comparison) in his article describing *X. yuliyae.*

Discussion
We only know this species from central and northwestern Costa Rica and Panama, Chiriqui, where it occurs in the lush tropical forests of medium elevation. Although it is the insect that caused us the most problems, finally we came to be able to recognize quite well, especially if the specimen is fresh. Its colour evokes that of *Xylophanes haxairei* Cadiou, 1985, which is not the case with any other representative of the group. It is much less contrasted than *X. libya*, its forewing less falcate and the apical spot is small or absent. It is the size of *X. nehamiai* **sp. n.** but its

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pattern is very different, the latter being beige-yellowish, paler and more lined.
Xylophanes confusa **sp. n.** has been bred in Costa Rica on two species of the genus *Psychotria* (Rubiaceae), *P. panamensis* and *P. berteriana* (Janzen, 2023). The female is unknown to us, but like *Xylophanes campisi* it was obtained by Costa Rican breeders. It differs from the male in its larger size and more rounded appearance; its colour and pattern are identical.

Genetic analysis (Plate 15)
As noted above, selected specimens in our collections were subjected to DNA barcode analysis using short sequences corresponding to the mitochondrial COI gene, via BOLD (Barcode of Life Data System, < www.boldsystems.org >) (Ratnasingham & Hebert, 2007). The following table gives the average genetic divergence using the K2 parameter among the seven species of the study.

Overview
A number of crucial points have emerged from this study. The first is that the task of studying the often large public and private collections of the *Xylophanes libya* group will be immense but it will be necessary if we are to be able to identify these seven species (and perhaps discover others that have so far eluded us) and clarify their distributions. This task will be severely hampered if fresh individuals are not available, as a first diagnosis always comes from an observation of the ground colour and the level of contrast of the insect, which only works well on freshly captured, and more freshly emerged specimens. With older specimens, this work will be difficult and as barcoding is often impossible, or at least more problematic, when the specimen is more than 15 years old; only dissection will remain, which itself gives results that are very difficult to interpret.
Whether there are any species diagnostic characters in the female genitalia remains to be determined.
However, there are some points to highlight that should facilitate these future collections recurations.
- *Xylophanes yuliyae* is immediately distinguished by its wing shape.
- Only one species, *Xylophanes pallescens*, seems to occur on the eastern slopes of the Andes.
- Along the Pacific coast of northern and central Mexico, only *Xylophanes faixi* **sp. n.** is expected to occur.
- In the rest of Mexico, east of the Sierra Madre Occidental, we find only *Xylophanes campisi* **sp. n.** and at present it is the only species known from Guatemala and Nicaragua. It ranges south to Costa Rica where it coexists with a similar *Xylophanes nehamiai* **sp. n.** , a larger species with different habitus and male genitalia.
- *Xylophanes libya* of Druce is an insect with an amazing but a constant forewing pattern that is strongly lined, darkened in the medial area, with a pointed and falcate apex and a conspicuous apical black spot. It is quite easily recognized.
-Also in Costa Rica and Panama is *Xylophanes confusa* **sp. n.**, a species that resembles *Xylophanes libya* but is less lined and contrasted, more homogeneous and, especially in fresh specimens, of a darker and greener in hue.

Taken together, and used with care, these six points should allow or at least help to curate collections. Clearly, a DNA barcode would allow the unambiguous identification of a specimen.
From what was initially a very confusing and daunting position, we feel that we have arrived at a solution that although difficult to apprehend is one that we believe to accord with reality. There are seven species in the "*libya*" complex and these seven species cannot be considered true cryptic species. They have their differences, certainly

	X. faixi	***X. campisi***	***X. nehamiai***	***X. yuliyae***	***X. libya***	***X. pallescens***	***X. confusa***
X. faixi	0	1.11	1.77	2.77	3.37	4.41	4.41
X. campisi		0	1.76	2.52	3.14	4.12	4.14
X. nehamiai			0	2.63	3.24	4.21	4.25
X. yuliyae				0	3.66	4.66	4.66
X. libya					0	2.7	2.7
X. pallescens						0	2.25
X. confusa							0

Figure 11
Interspecific mean K2P (Kimura 2-Parameter) based on the analysis of COI fragments (>500 bp) among the species of the *Xylophanes libya* group.

Species \ Character	BIN	Distribution	Apical spot on the FW	Harpe	Left process of the phallus	Right process of the phallus
***Xylophanes faixi* sp. n.**	ACE3843	Mexico, Pacific Coast	Absent	Flat, wide curved and sharp	Dentate heterogeneously, with groups of spines	Almost horizontal
***Xylophanes campisi* sp. n.**	AAA7673	Mexico to Costa Rica	Absent	Quite thin and not very curved	Strongly toothed	Curved towards the base
***Xylophanes nehamiai* sp. n.**	ACF2389	Costa Rica & NW Venezuela	Absent	Very short, not very curved	Strongly dorsally dentate	Curved towards the base
Xylophanes yuliyae	AAA7676	S Mexico to Costa Rica	Not very marked	Very fine, slight curvature	Finely toothed	Recurved towards the base and very wide
Xylophanes libya	AAA7672	Panama to Western Ecuador	Well-marked	Basal, projected upwards	Finely toothed, more strongly dorsally	Curved towards the base
***Xylophanes confusa* sp. n.**	ABZ1864	Costa Rica and Panama	Not very marked	Terminal and not very acute	Finely toothed	Almost horizontal
Xylophanes pallescens	ABZ6193	Colombia to Bolivia	Present	Very variable, always very acute	Finely and often very weakly toothed	Curved towards the base, little toothed (or single tooth)

Figure 12
BIN, distribution and genital characteristics of the seven species of the *Xylophanes libya* group.

subtle but constant. The real problem is that they cannot be identified with just a few specimens. It is necessary to have series, and if possible fresh specimens, and to take a comprehensive overview of the observed habitus characteristics, ideally supplemented by dissections of the genital structures. Ideally, these seven species should all be reared, for it is interesting to note that Prof. D. H. Janzen's team have already found X. *campisi* **sp. n.** and *X. confusa* **sp. n.** feeding on different larval food plants.

We hope to have made the determination process accessible to all future observers and await the publication of their conclusions.

Acknowledgements
We first thank the staff of the laboratory of the CCDB (Canadian Centre for DNA Barcoding) at the University of Guelph (Ontario, Canada) for the genetic analysis of part of our samples and DNA sequences, and the staff of BOLD (the "BOLD team") for data processing.
We would also like to warmly thank all the people, friends and/or colleagues, who kindly provided us with the specimens essential to this study, in particular Jérôme Barbut, Jean-Michel Bompar, Daniel Curoe, Olivier Felis, Daniel Herbin, Daniel H. Janzen, Michel Laguerre, Antoine Lévèque, José Monzon Sierra, Guillermo Nogueira, Rodolphe Rougerie, Julien Touroult and Benoit Vincent. May any we have inadvertently forgotten forgive us.
The first author wishes to thank in particular his teammate and long-time friend, Daniel Herbin, with whom he carried out missions with exceptional results in Mexico, Ecuador and Bolivia, missions that provided much of the material studied in this note.

Once again, we would like to express our gratitude and admiration to Professor Dan Janzen and his team (University of Pennsylvania) for the incredible work they have done in Costa Rica on the Sphingidae in general and species of the *Xylophanes libya* group in particular, both in terms of our knowledge of the larval stages of these species, but also for having initiated one of the most important Barcoding campaigns, bringing out the issue studied here.

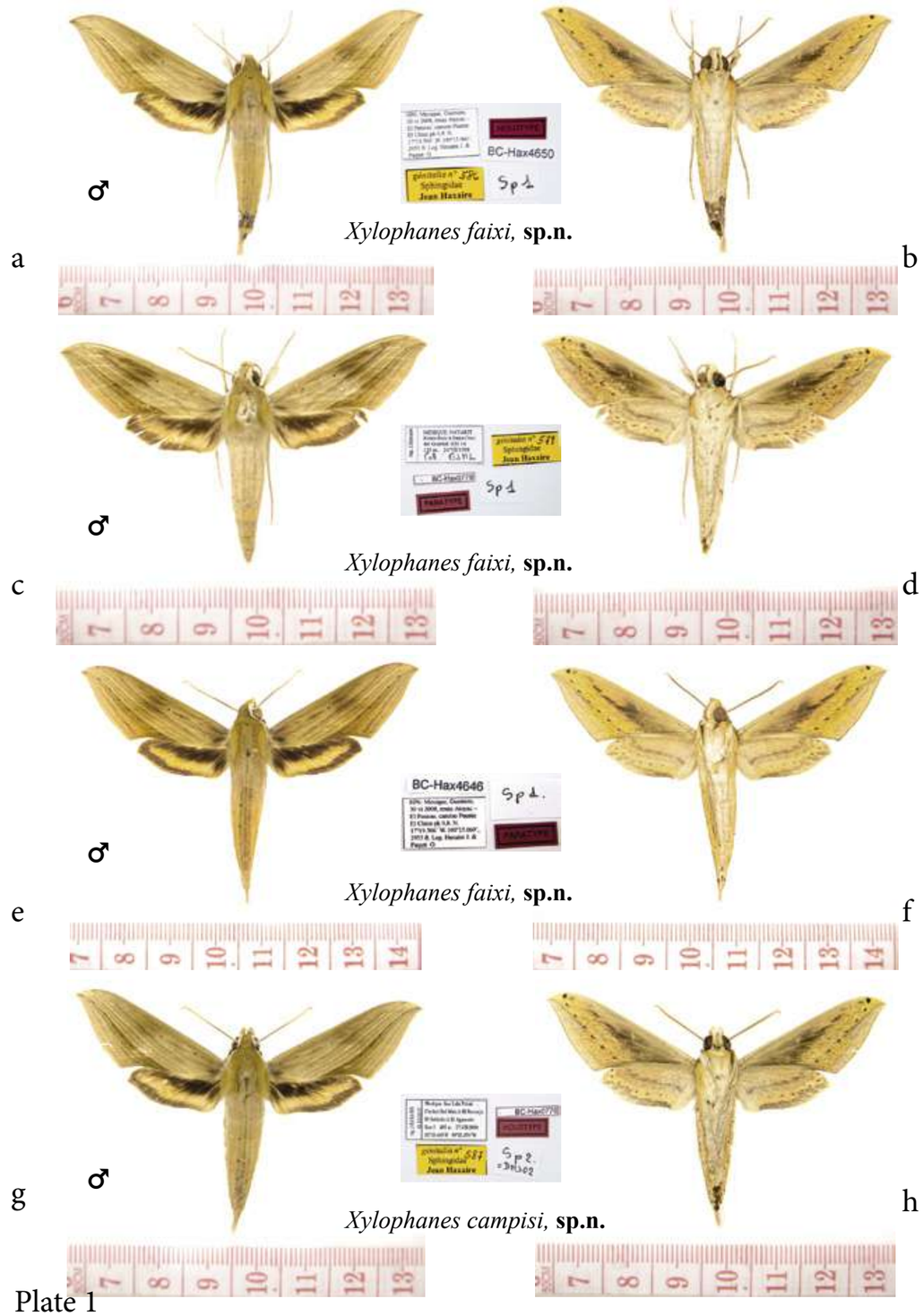
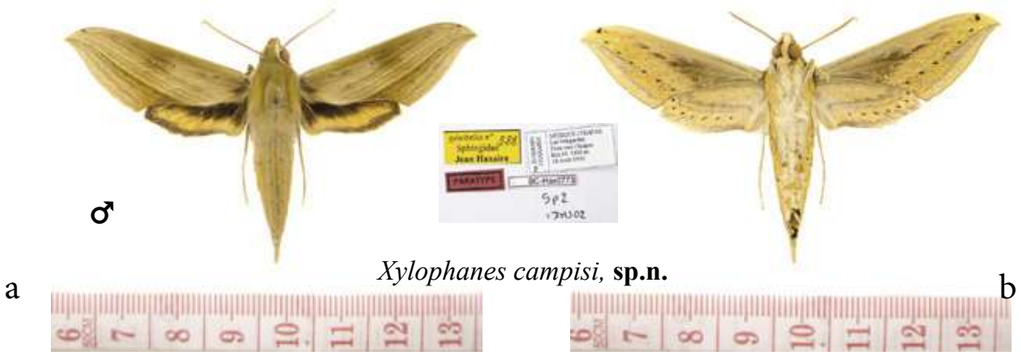


Plate 1



a *Xylophanes campisi,* **sp.n.** b

c *Xylophanes nehamiai,* **sp.n.** d

e *Xylophanes nehamiai,* **sp.n.** f

g *Xylophanes yuliyae* h

Plate 2

a *Xylophanes yuliyae* b

c *Xylophanes yuliyae* d

e *Xylophanes confusa,* **sp.n.** f

g *Xylophanes confusa,* **sp.n.** h

Plate 3

a *Xylophanes confusa,* **sp.n.** b

c *Xylophanes pallescens* d

e *Xylophanes pallescens* f

g *Xylophanes pallescens* h

Plate 4

a *Xylophanes pallescens* b

c *Xylophanes pallescens* d

e *Xylophanes libya* f

g *Xylophanes libya* h

Plate 5

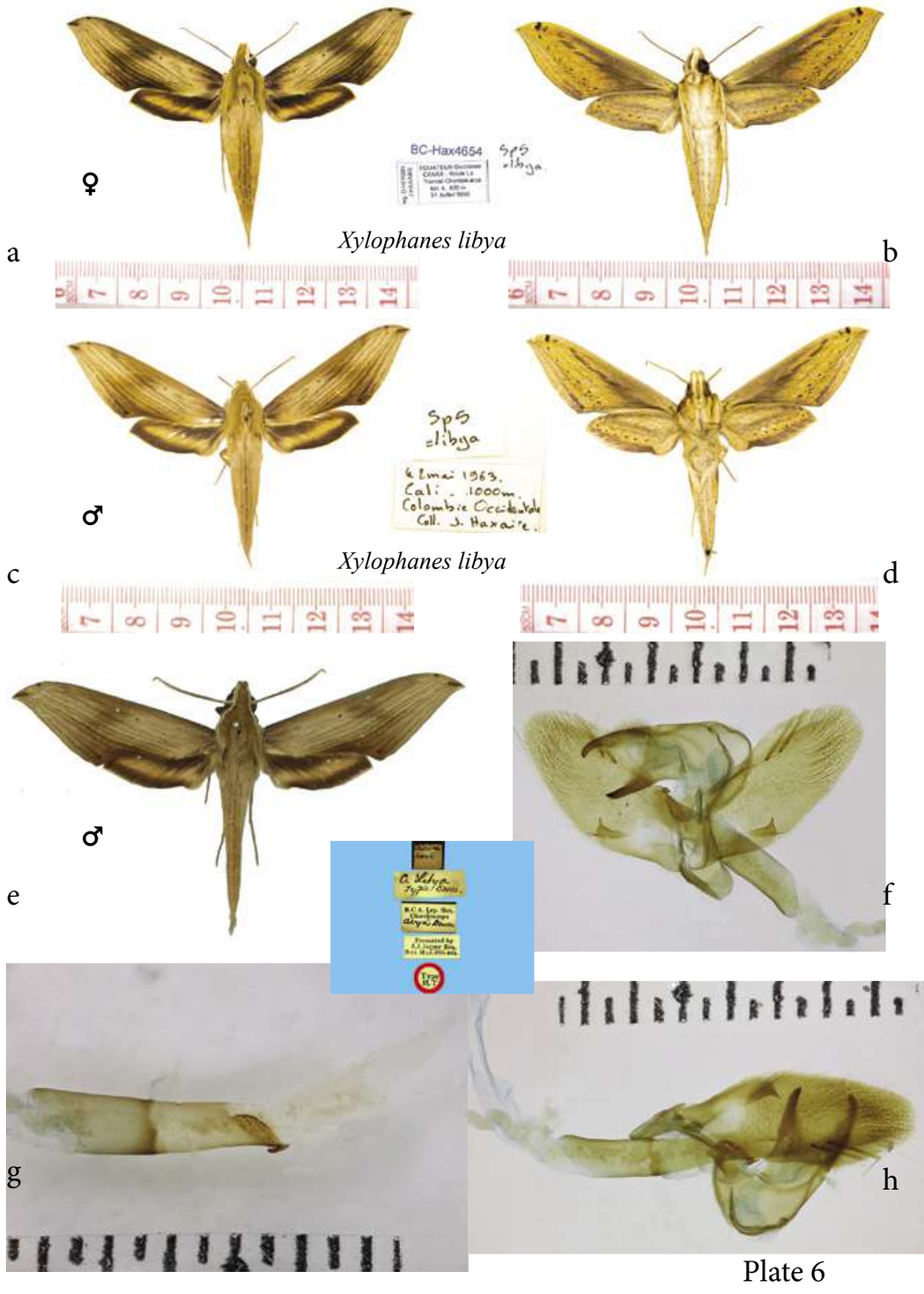


Plate 6

Xylophanes faixi, **sp.n.**

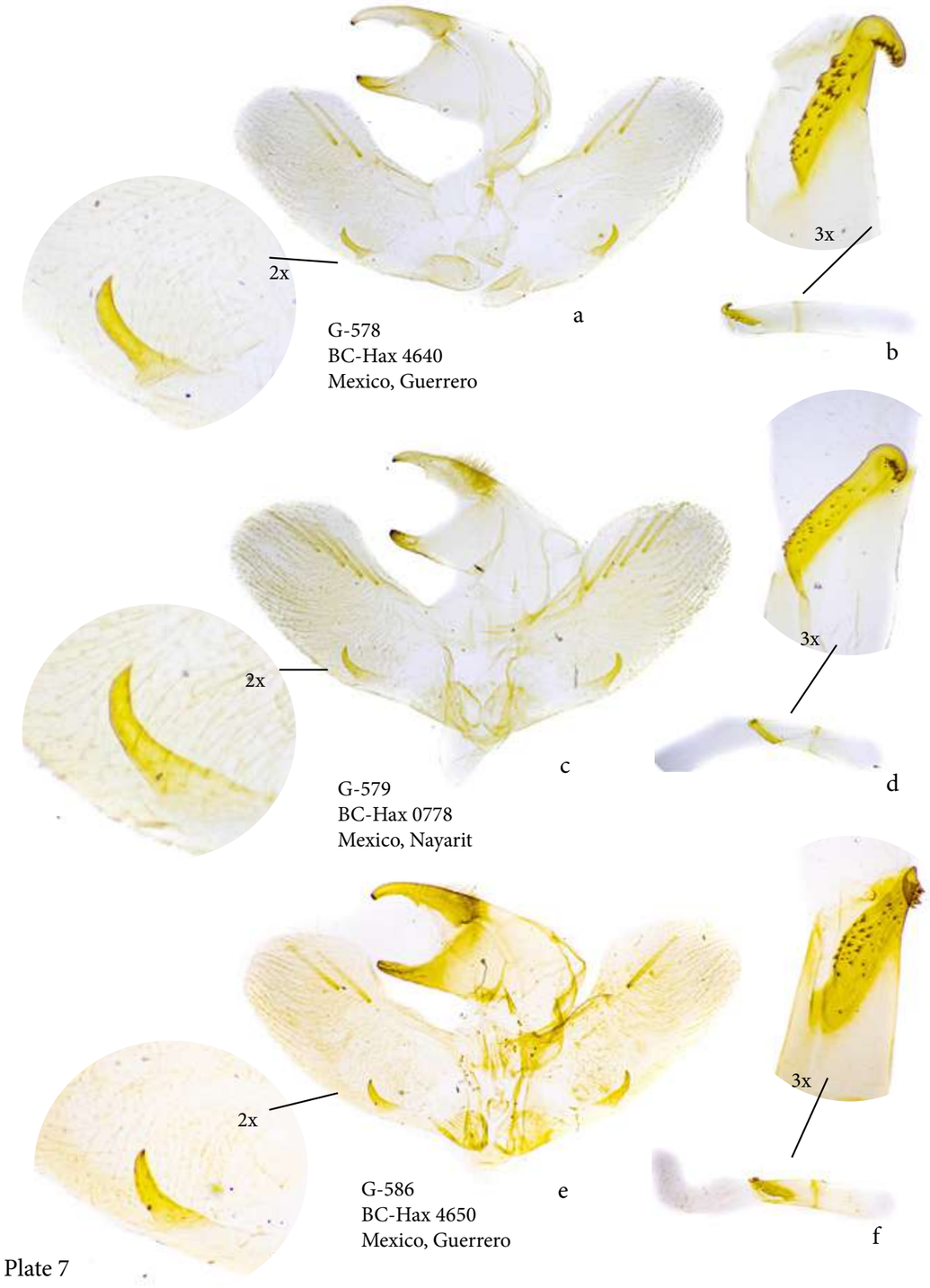


Plate 7

Xylophanes campisi, **sp.n.**

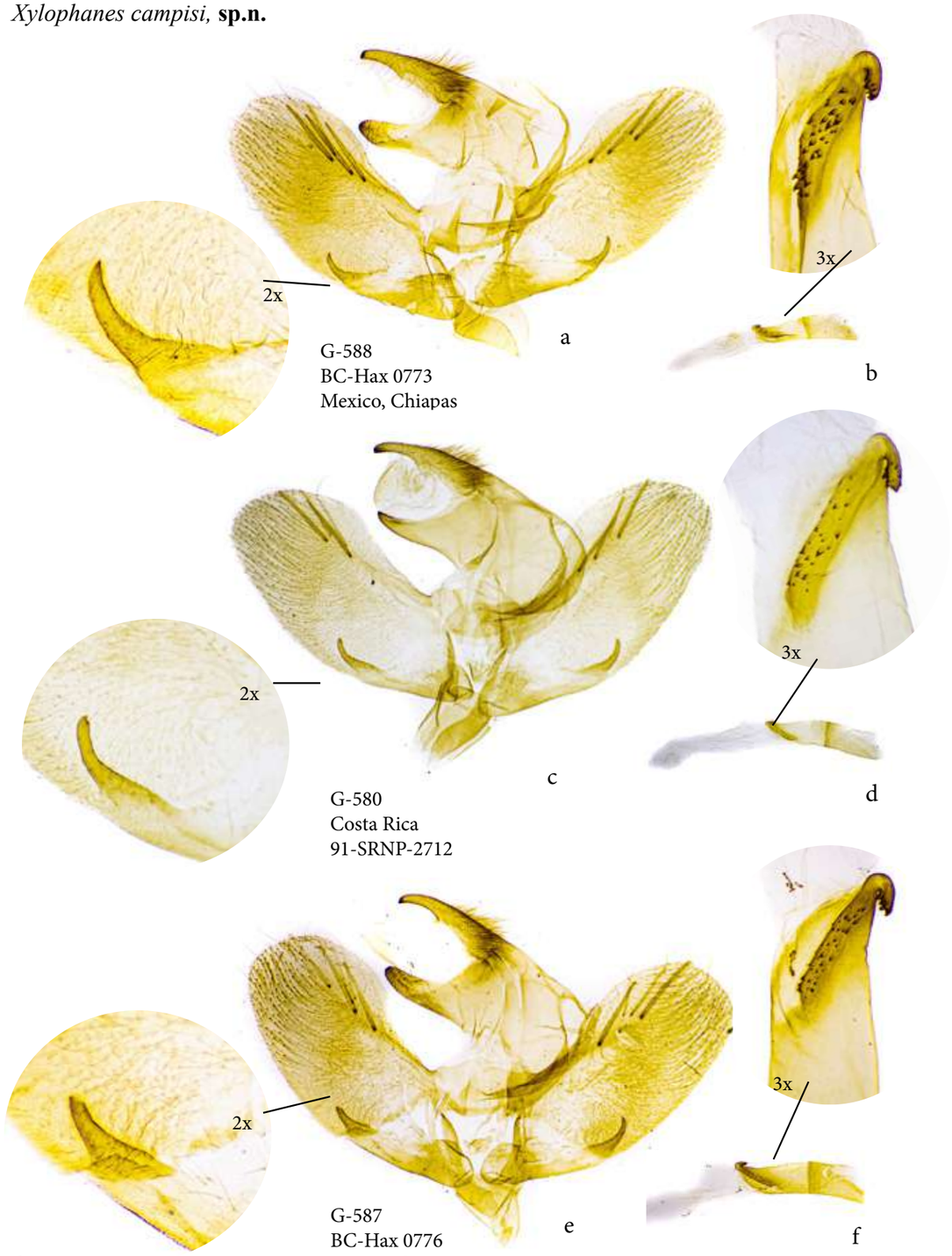


Plate 8

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Xylophanes nehamiai, **sp.n.**

Plate 9

Xylophanes yuliyae, Haxaire [2018]

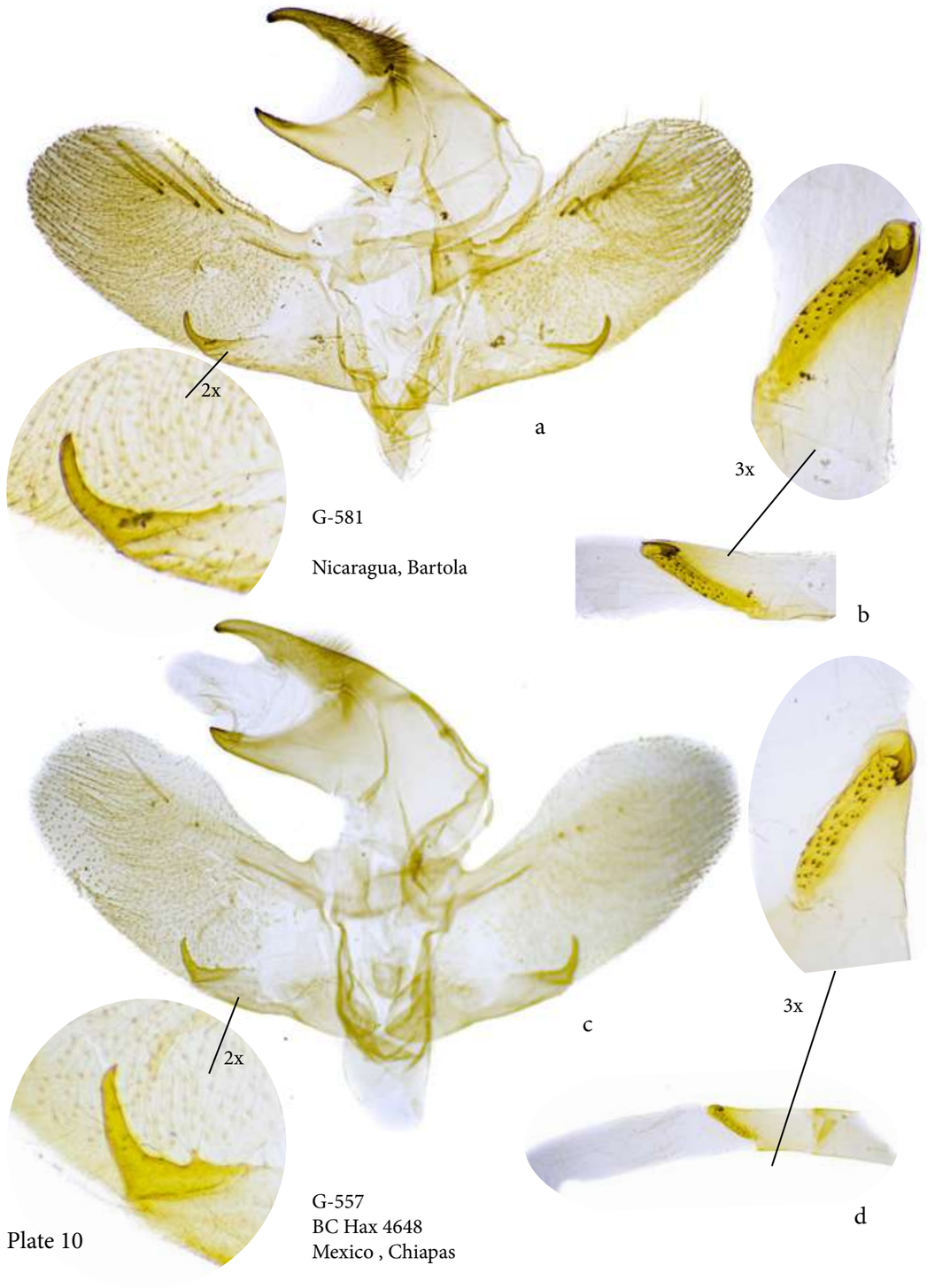

Plate 10

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Xylophanes libya, (Druce, 1878)

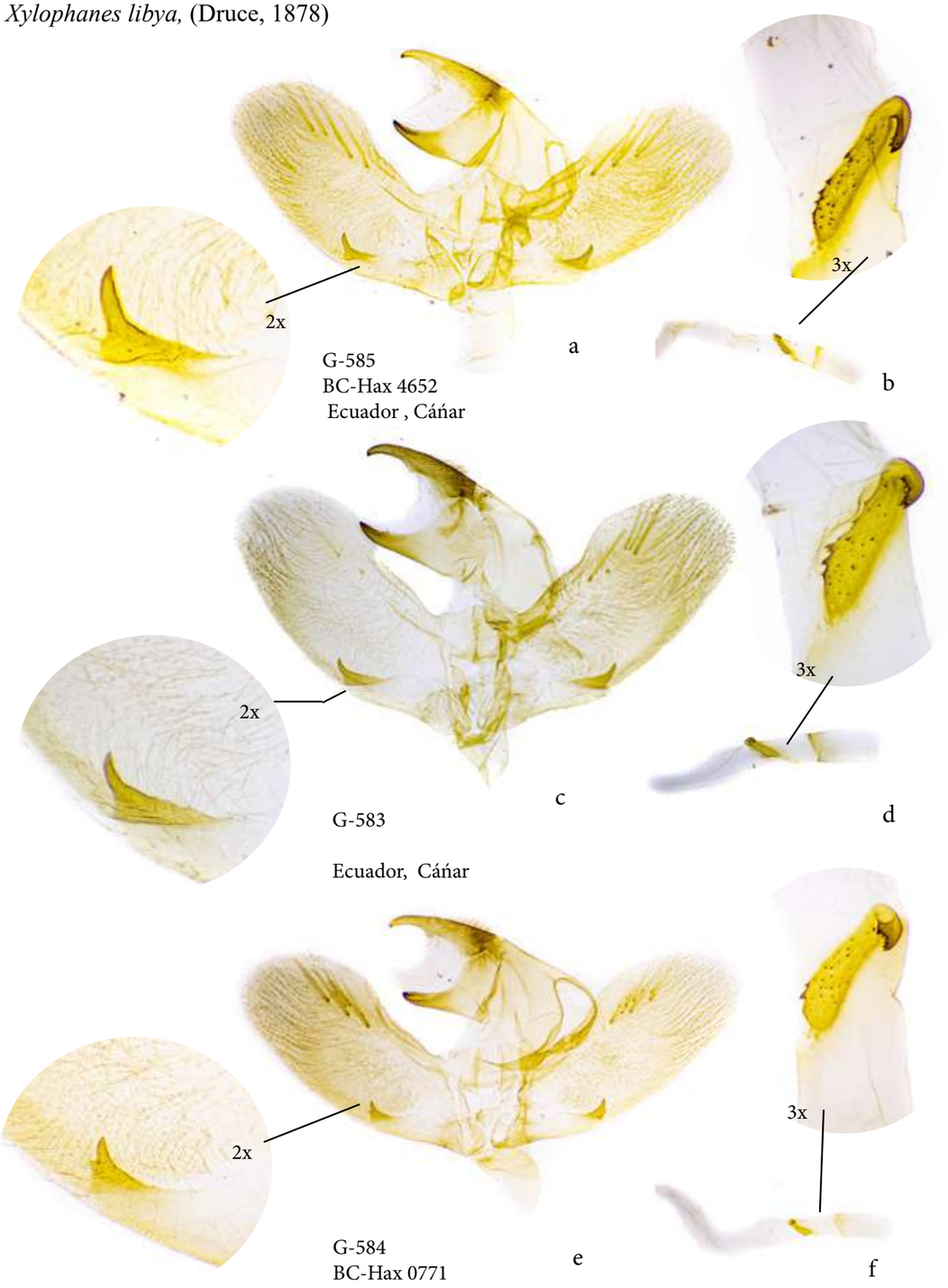

Plate 11

Xylophanes confusa, **sp.n.**

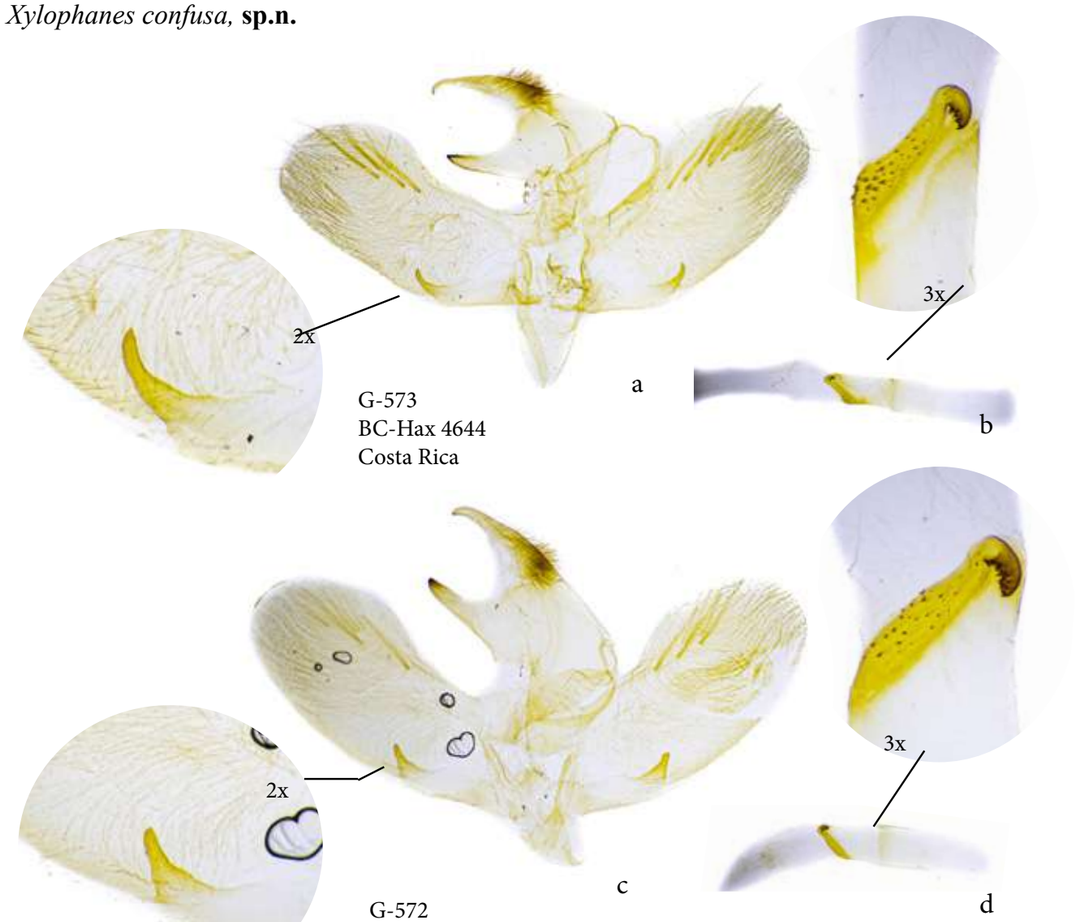

Plate 12

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Xylophanes pallescens Closs,1917, **stat. rev.**

Plate 13

Xylophanes pallescens Closs,1917, **stat.rev.**

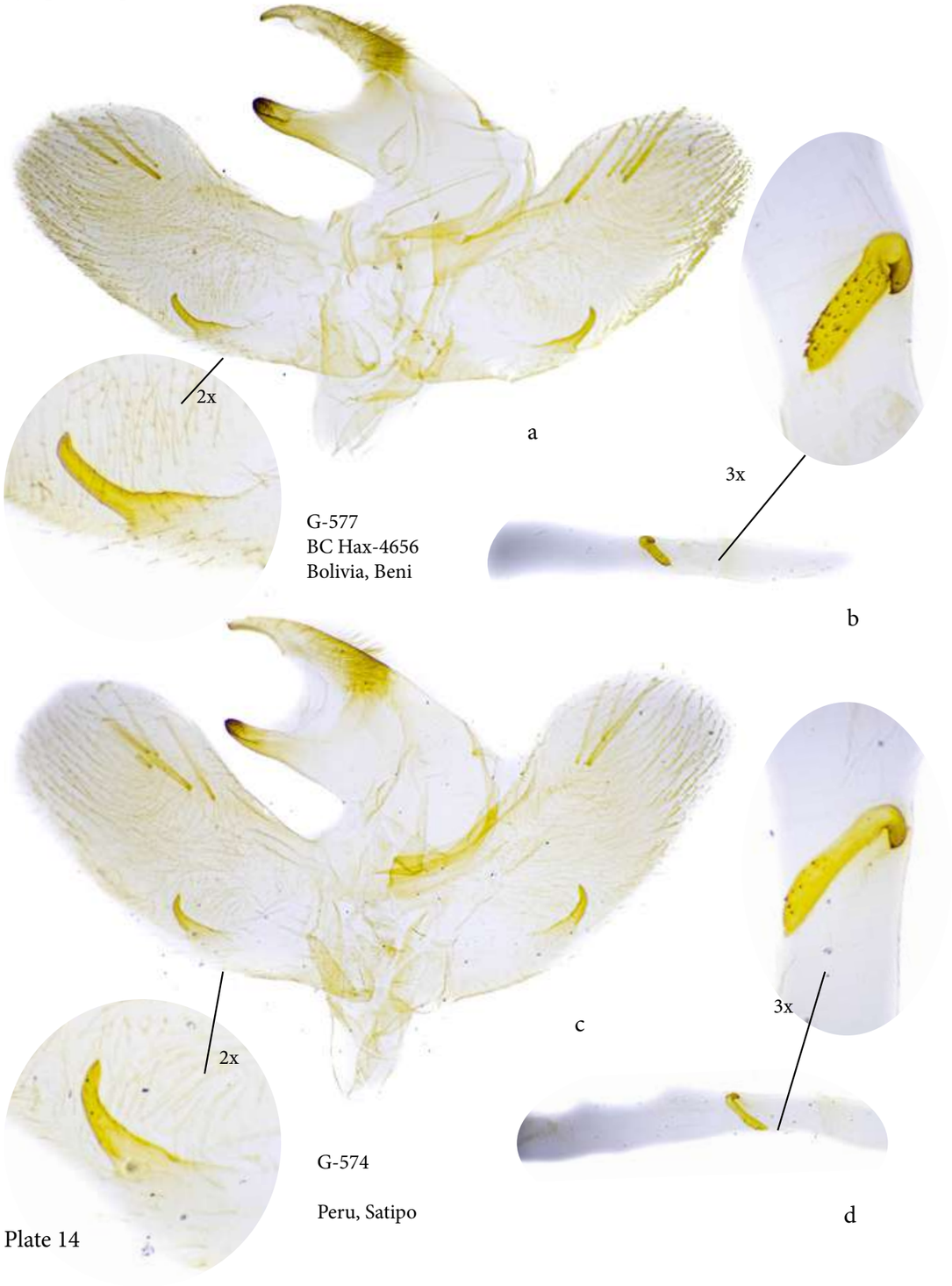

Plate 14

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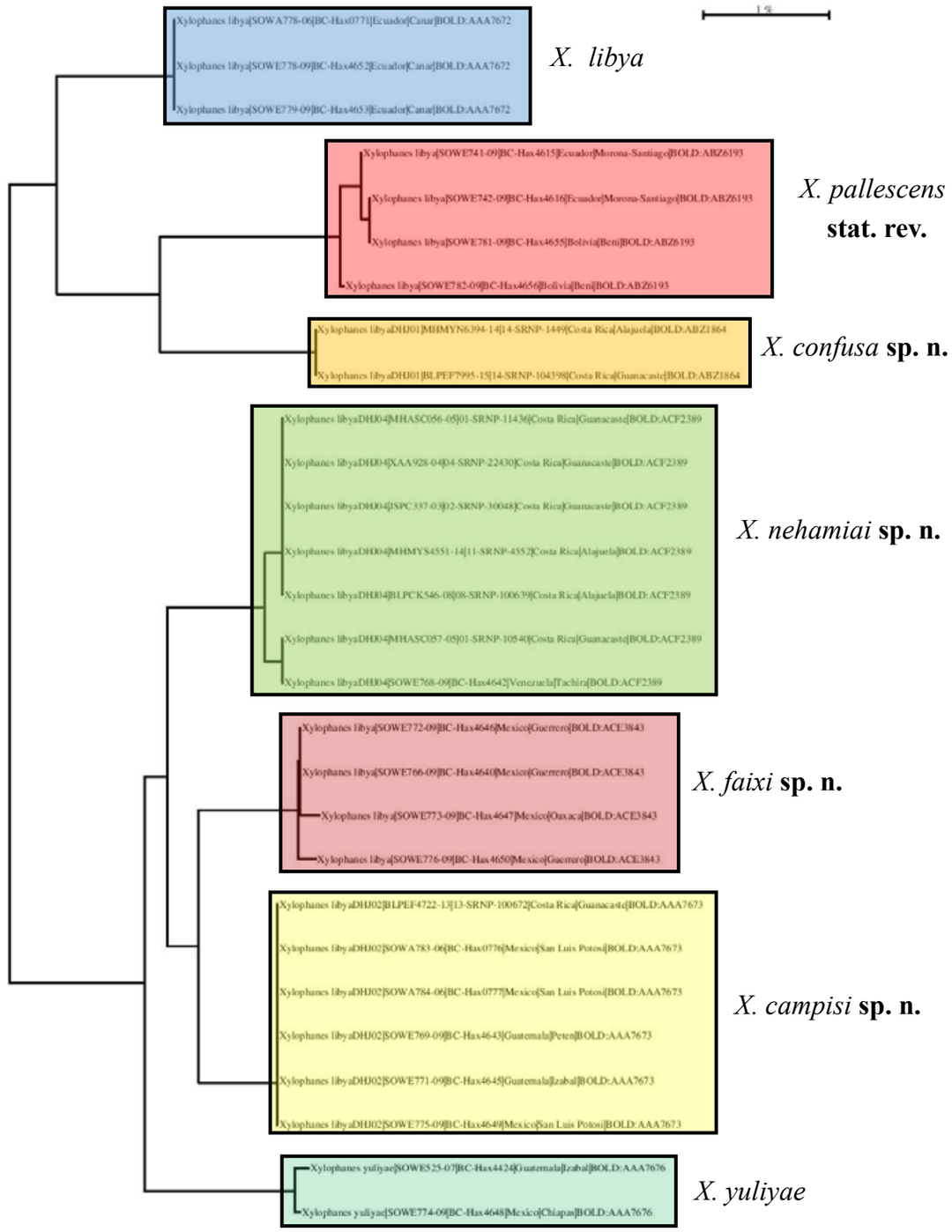

Plate 15

Colour plate legends

Plate 1

Habitus of the species of the *X. libya* group, left, upperside and right, underside; a-f - *Xylophanes faixi* **sp. n**. g-h – *Xylophanes campisi* **sp. n**.

Plate 2

Habitus of the species of the *X. libya* group, left, upperside and right, underside; a-b - *Xylophanes campisi* **sp. n**. c-f – *Xylophanes nehamiai* **sp. n**. g-h – *Xylophanes yuliyae*.

Plate 3

Habitus of the species of the *X. libya* group, left, upperside and right, underside; a-d - *Xylophanes yuliyae*. e-h – *Xylophanes confusa* **sp. n**.

Plate 4

Habitus of the species of the *X. libya* group, left, upperside and right, underside; a-b - *Xylophanes confusa* **sp. n**. c-h – *Xylophanes pallescens* **stat. rev**.

Plate 5

Habitus of the species of the *X. libya* group, left, upperside and right, underside; a-d - *Xylophanes pallescens* **stat. rev.** e-h – *Xylophanes libya*.

Plate 6

Habitus and male genitalia of *X. libya*, left, upperside and right, underside; a-d - *Xylophanes libya*. e- habitus of the lectotype, with its labels. f-h- genitalia of the lectotype © The Trustees of the Natural History Museum, London (f- general view. g-phallus. h- genitalia, lateral view).

Plate 7

Male genitalia of the species of the *libya* group: general view (centre), detail of the harpe (left) phallus and apical plate of the phallus (right); a-f – *Xylophanes faixi* **sp. n**.

Plate 8

Male genitalia of the species of the *libya* group: general view (centre), detail of the harpe (left) phallus and apical plate of the phallus (right); a-f – *Xylophanes campisi* **sp. n**.

Plate 9

Male genitalia of the species of the *libya* group: general view (centre), detail of the harpe (left) phallus and apical plate of the phallus (right); a-d – *Xylophanes nehamiai* **sp. n**.

Plate 10

Male genitalia of the species of the *libya* group: general view (centre), detail of the harpe (left) phallus and apical plate of the phallus (right); a-d – *Xylophanes yuliyae*.

Plate 11

Male genitalia of the species of the *libya* group: general view (centre), detail of the harpe (left) phallus and apical plate of the phallus (right); a-f – *Xylophanes libya*.

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Plate 12

Male genitalia of the species of the *libya* group: general view (centre), detail of the harpe (left) phallus and apical plate of the phallus (right); a-f – *Xylophanes confusa* **sp. n**.

Plate 13

Male genitalia of the species of the *libya* group: general view (centre), detail of the harpe (left) phallus and apical plate of the phallus (right); a-f – *Xylophanes pallescens* **stat. rev**.

Plate 14

Male genitalia of the species of the *libya* group: general view (centre), detail of the harpe (left) phallus and apical plate of the phallus (right); a-f – *Xylophanes pallescens* **stat. rev**.

Plate 15

Neighbor-joining tree of samples of the seven species of the *Xylophanes libya* group DNA barcode sequences analyzed showing the seven well-isolated BINs.