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A systematic revision of the bats (Chiroptera) of Honduras: an updated checklist with corroboration of historical specimens and new records

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Abstract

During the last century, survey efforts for mammals in Honduras have been few and most distributional and conservation assessments of bats have been based on historical records. Taxonomy of many records has changed. Moreover, a number of supposed Honduran occurrences are based on records from bordering countries without confirmation by a Honduran voucher. Therefore, the list of bats of Honduras lacks precision. Here, we update the number of species in the country, including taxonomic changes not reflected in recent works and new records based on museum specimens. The known number of species for Honduras is 113 with seven expected (*Cormura brevirostris*, *Lampronycteris brachyotis*, *Mesophylla macconnelli*, *Molossus coibensis*, *M. pretiosus*, *Thyroptera discifera* and *Trinycteris nicefori*), based on records in adjoining countries. We provide a new record for Honduras of *Natalus lanatus*. We confirm the presence of *Cynomops greenhalli* and *Diaemus youngii* and clarify the taxonomic status of *Artibeus intermedius*, *Chiroderma gorgasi*, *Eumops ferox*, *Gardnerycteris keenani*, *Lasiurus frantzii*, *Myotis pilosatibialis, Molossus* and *Pteronotus* species, and *Tonatia bakeri*. We recommend a reassessment of the conservation status of the bats of Honduras considering recent changes and that a number of species (e.g. *Choeronycteris mexicana*) have not been observed since their reports in historical records. This requires an update of the taxonomic identification keys for Honduras. The updated checklist below demonstrates the high biodiversity of Honduran bats but is also an example of how poorly many groups have been studied since they were first recorded in the country.

Key Words

Artibeus intermedius, Central America, *Cynomops greenhalli*, *Diaemus youngii*, *Natalus lanatus*, taxonomy

Introduction

Rodríguez Herrera and Sánchez (2015) reported 98 species of bats for Guatemala, 109 for Honduras, 68 for El Salvador, 102 for Nicaragua and 114 for Costa Rica. In the recent list of bats of Mexico presented by Ramírez-Pulido et al. (2014), 139 species were reported; this is the highest number of bat species for any Mesoamerican country. Recent efforts to study bats in the Mesoamerican region have increased the number of bat species known. For example, Kraker-Castañeda et al. (2016) listed 100 species for Guatemala, Mora et al. (2018) and Turcios-Casco et

al. (2020a) increased the list for Honduras to 111 plus four expected species and recently, Medina-Fitoria and Martínez-Fonseca (2019) and Saldaña Tapia et al. (2020) increased the list for Nicaragua to 111 species. In addition, York et al. (2019) reported 120 for Costa Rica. This demonstrates that Central America is one of the regions in the world with the highest number of genera (66) of bats with more than 170 recorded species (Rodríguez Herrera and Sánchez 2015), of which over 65.29% occur in Honduras. Not only have researchers recorded new species for each country, but they have also carried out systematic and taxonomic studies that have defined new lineages, new species and new taxonomic arrangements.

Frequent taxonomic changes, molecular vs. morphological methods of delineating species and historical vouchers whose identifications have not been updated, are amongst the factors that affect the number of species known for each country. For this reason, our study aims to update species distributions, species checklists and corroborate museum vouchers for the bats of Honduras.

During the last century, sampling effort in Honduras has been very low and most distributional and conservation assessments of bat species have been based on historical records (Turcios-Casco and Medina-Fitoria 2019). Mora (2016) provided the first taxonomic keys for identification of Honduran bats, so it was no longer necessary to rely on keys from other countries [e.g. Costa Rica (Timm et al. 1999) and Mexico (Medellín et al. 2008)]. Such practices led to misidentifications of species endemic to northern Central America, but not found in Costa Rica or Mexico [e.g. *Artibeus inopinatus* Davis & Carter, 1964 (Fig. 1A, B)]. Like Guatemala (Kraker-Castañeda et al. 2016), Honduras has had a questionable number of known bat species since the 1900s. Unlike other megadiverse countries such as Mexico (Medellín et al. 2008; Ramírez-Pulido et al. 2014) and Costa Rica (LaVal and Rodríguez-H 2002; Rodríguez-Herrera et al. 2014; York et al. 2019), Honduras has had relatively few bat studies and distribution and ecology of most species are still unknown (Turcios-Casco et al. 2019b).

We summarise the history of bat research in Honduras: the description of *Ectophylla alba* H. Allen, 1892 (see McCarthy et al. 1993) was based on Honduran specimens in 1892 and then Allen (1898) further described the skull and teeth of this species. Goodwin (1940) described three new bats from Honduras (*Phylloderma septentrionalis* Goodwin, 1940, *Sturnira hondurensis* Goodwin, 1940 and *Eumops underwoodi* Goodwin, 1940) and provided the first record of *Enchisthenes hartii* (Thomas, 1892) for North America, based on a mammal collection made by C. F. Underwood. Subsequently, Goodwin (1942) presented the first checklist of mammals of Honduras with 69 bat species including *Macrotus macrotus* (= *M. waterhousii* Gray, 1843). More records were added to the bat list of Honduras by Davis and Carter (1964), Davis et al. (1964), LaVal (1969) and Valdez and LaVal (1971). Jones et al. (1977) included at least 96 species for Honduras in their "Annotated checklist of the bats of Mexico and Central America", including *Micronycteris brachyotis* Dobson, 1879 [= *Lampronycteris brachyotis* (Dobson, 1878)]. Benshoof et al. (1984) added more records and Jones et al. (1988) reported that at least 100 species of bats included Honduras in their known distributions (e.g. *Artibeus intermedius* J.A. Allen, 1897). Consequently, McCarthy et al. (1993) noted 99 species for Honduras in his checklist (but only listed 98 in their final table). Reid (2009) included the distribution of some species that still remained uncertain in Honduras (e.g. *Diaemus youngii* (Jentink, 1893) and *Hylonycteris underwoodi* Thomas, 1903). Hernández (2015) mentioned 112 species based on the efforts done by the Program for Bat Conservation in Honduras (PCMH), but in the final table in Rodríguez Herrera and Sánchez (2015), there were only 109 species listed. Mora (2016) reported 110 species and four expected species and McCranie et al. (2018) and Mora et al. (2018) upheld the same number of species. The only new record for Honduras after the report by Mora et al. (2018) is by Turcios-Casco et al. (2020a), who updated the number of Honduran species to 111 with *Chiroderma gorgasi* Handley, 1960 (referring to *C. trinitatum* Goodwin, 1958).

In response to the uncertain number of bat species in Honduras, we provide an update, including taxonomic proposals not considered by Mora et al. (2018). These include: Mantilla-Meluk and Muñoz-Garay (2014) for *Myotis pilosatibialis* LaVal, 1973 and Pavan and Marroig (2016) for Mormoopidae. Mora et al. (2018) included the changes of *Pteronotus mesoamericanus* Smith, 1972, but not *P. fulvus* (Thomas, 1892) and *P. psilotis* (Dobson, 1878).

They also failed to consider Gregorin et al. (2016) for *Eumops* Miller, 1906, Moras et al. (2018) for *Cynomops* Thomas, 1920 and some works of Loureiro et al. (2018, 2020) for *Molossus* É. Geoffroy, 1805. Finally, new records are given based on the verification of museum specimens examined by us, with remarks on their taxonomy and systematics.

Materials and methods

To update the number of bat species in Honduras, we first reviewed the database of GBIF.org (2019). Amongst the approximately 9000 Honduran records of bats deposited in museums over the world, we re-examined certain vouchers that were misidentified and that we could correctly identify, based on cranial and external measurements. These were measured to the nearest 0.01 mm with digital calipers. Measurements followed Srinivasulu et al. (2010), except for tragus length (Tr) and width (TrW) that followed Dietz and von Helversen (2004): forearm length (FA); tibia length (Tib); ear length (E); ear width (EW); thumb length (Th); length of the calcar (Ca); tail length (T); body length (BH); hindfoot length (HF); wingspan (WS); fifth metacarpal length (5mt); third metacarpal length (3mt); length of the first phalanx

of digit III (1ph); length of the second phalanx of digit III (2ph); and the length of the third phalanx of digit III (3ph). Skull measurements obtained from vouchers followed Simmons and Voss (1998), Tejedor (2011) and Giménez and Giannini (2016). These included condyloincisive length (CIL), condylocanine length (CCL), zygomatic breadth (ZB), height of braincase (HB), mastoid breadth (MB), postorbital breadth (PB), mandibular tooth row length (MBL), maxillary tooth row length (MTL), depth of braincase (DB), breadth across molars (BAM), and breadth across canines (BAC).

We accept the changes of *Gardnerycteris* Hurtado & Pacheco, 2014 for *G. keenani* (Handley, 1960) (Hurtado and D'Elía 2018) and *Mimon* Gray, 1847 for *M. cozumelae* Goldman, 1914 (Hurtado and Pacheco 2014). We recognise *Lophostoma evotis* (Davis & Carter, 1978) as a separate species from *L. silvicolum* d'Orbigny, 1836 (Davis and Carter 1978; Medellín and Arita 1989) and accept the changes proposed by Pavan and Marroig (2016) for Mormoopidae. The two species of *Sturnira* Gray, 1842 that occur in Honduras are *S. hondurensis* and *S. parvidens* Goldman, 1917 (Velazco and Patterson 2013). We also accept the taxonomic changes of *Uroderma bilobatum* Peters, 1866 to *U. convexum* Lyon, 1902 and *U. davisi* Baker and McDaniel, 1972 (Mantilla-Meluk 2014). We recognise the distinction of the two species of *Rhogeessa* H. Allen, 1866 proposed by Baird et al. (2008, 2012). We treat *Aeorestes* Fitzinger, 1870 and *Dasypterus* W. Peters, 1870 proposed by Baird et al. (2015) as subgenera of *Lasiurus* Gray, 1831. We recognise *Dermanura* Gervais, 1856 as a genus separate from *Artibeus* Leach, 1821, following Hoofer et al. (2008) and York et al. (2019). In addition, we agree with York et al. (2019) in the recognition of *A. intermedius* supported by Larsen et al. (2013) and currently accepted by York et al. (2019) and Simmons and Cirranello (2020). We also consider *Eumops ferox* (Gundlach, 1861) as the species that occurs in Central America (McDonough et al. 2008; Baker et al. 2009; Gregorin et al. 2016) and we followed Simmons and Voss (1998) in the recognition of *Eptesicus andinus* J. A. Allen, 1914, *E. brasiliensis* (Desmarest, 1819) and *E. chiriquinus* Thomas, 1920 as different species [see York et al. (2019)]. For the other species, we follow Wilson and Mittermeier (2019). Finally, we reviewed the new records for Honduras following McCarthy et al. (1993) that could be verified as vouchers with museum catalogue numbers, records based on vocalisations found in published articles or new information based on the authors' data.

Acronyms used for the museums are the following:

EAPZ Biodiversity Collection, Escuela Agrícola Panamericana, Honduras
LACM Vertebrate Collection, Natural History Museum of Los Angeles County, USA
MVB Museum of Vertebrate Zoology, Portland State University, USA
PSM Vertebrates Collection, Museum of Natural History, University of Puget Sound, USA
TCWC The Biodiversity Research and Teaching Collections (Texas A&M University), USA
TTU Museum of Texas Tech University, USA
UCR Universidad de Costa Rica, Costa Rica
UNAH Universidad Nacional Autónoma de Honduras, Ciudad Universitaria, Honduras
UVS Vertebrate Collection, Universidad Nacional Autónoma de Honduras, Valle de Sula, Honduras

Results

Annotated list of species of the species that occur in Honduras, authors and years follow Simmons and Cirranello (2020):

Emballonuridae Gervais, 1856
Emballonurinae Gervais, 1856
***Balantiopteryx* Peters, 1867**
1. *Balantiopteryx io* **Thomas, 1904**
2. *Balantiopteryx plicata* **Peters, 1867**
***Centronycteris* Gray, 1838**
3. *Centronycteris centralis* **Thomas, 1912**
***Diclidurus* Wied-Neuwied, 1819**
4. *Diclidurus albus* **Wied-Neuwied, 1819**
***Peropteryx* Peters, 1867**
5. *Peropteryx kappleri* **Peters, 1867**
6. *Peropteryx macrotis* **(Wagner, 1843)**
***Rhynchonycteris* Peters, 1867**
7. *Rhynchonycteris naso* **(Wied-Neuwied, 1820)**
***Saccopteryx* Illiger, 1811**
8. *Saccopteryx bilineata* **(Temminck, 1838)**
9. *Saccopteryx leptura* **(Schreber, 1774)**
Phyllostomidae Gray, 1825
Carolliinae Miller, 1924
***Carollia* Gray, 1838**
10. *Carollia castanea* **H. Allen, 1890**
11. *Carollia perspicillata* **(Linnaeus, 1758)**
12. *Carollia sowelli* **Baker, Solari, & Hoffmann, 2002**
13. *Carollia subrufa* **(Hahn, 1905)**
Desmodontinae J.A. Wagner, 1840
***Desmodus* Wied-Neuwied, 1826**
14. *Desmodus rotundus* **(E. Geoffroy, 1810)**
***Diaemus* Miller, 1906**
15. *Diaemus youngii* **(Jentink, 1893)**
***Diphylla* Spix, 1823**
16. *Diphylla ecaudata* **Spix, 1823**
Glossophaginae Bonaparte, 1845
***Anoura* Gray, 1838**
17. *Anoura geoffroyi* **Gray, 1838**
***Choeroniscus* Thomas, 1928**
18. *Choeroniscus godmani* **(Thomas, 1903)**
***Choeronycteris* Tschudi, 1844**
19. *Choeronycteris mexicana* **Tschudi, 1844**
***Glossophaga* E. Geoffroy, 1818**
20. *Glossophaga commissarisi* **Gardner, 1962**

21. *Glossophaga leachii* **Gray, 1844**
22. *Glossophaga soricina* **(Pallas, 1766)**
Hylonycteris **Thomas, 1903**
23. *Hylonycteris underwoodi* **Thomas, 1903**
Leptonycteris **Lydekker, 1891**
24. *Leptonycteris yerbabuenae* **Martínez & Villa-R, 1940**
Lichonycteris **Thomas, 1895**
25. *Lichonycteris obscura* **Thomas, 1895**
Glyphonycterinae Baker, Solari, Cirranello & Simmons, 2016
Glyphonycteris **Thomas, 1896**
26. *Glyphonycteris daviesi* **(Hill, 1964)**
27. *Glyphonycteris sylvestris* **Thomas, 1896**
Lonchorhininae Gray, 1866
Lonchorhina **Tomes, 1863**
28. *Lonchorhina aurita* **Tomes, 1863**
Micronycterinae Van Den Bussche, 1992
Micronycteris **Gray, 1866**
29. *Micronycteris hirsuta* **(Peters, 1869)**
30. *Micronycteris microtis* **Miller, 1898**
31. *Micronycteris minuta* **(Gervais, 1856)**
32. *Micronycteris schmidtorum* **Sanborn, 1935**
Phyllostominae Gray, 1825
Chrotopterus **Peters, 1865**
33. *Chrotopterus auritus* **(Peters, 1856)**
Gardnerycteris **Hurtado & Pacheco, 2014**
34. *Gardnerycteris keenani* **(Handley, 1960)**
Lophostoma **d'Orbigny, 1836**
35. *Lophostoma brasiliense* **Peters, 1866**
36. *Lophostoma evotis* **(Davis & Carter, 1978)**
37. *Lophostoma silvicolum* **d'Orbigny, 1836**
Macrophyllum **Gray, 1838**
38. *Macrophyllum macrophyllum* **(Schinz, 1821)**
Mimon **Gray, 1847**
39. *Mimon cozumelae* **Goldman, 1914**
Phylloderma **Peters, 1865**
40. *Phylloderma stenops* **Peters, 1865**
Phyllostomus **Lacépède, 1799**
41. *Phyllostomus discolor* **Wagner, 1843**
42. *Phyllostomus hastatus* **(Pallas, 1767)**
Tonatia **Gray, 1827**
43. *Tonatia bakeri* **Williams, Willig & Reid, 1995**
Trachops **Gray, 1847**
44. *Trachops cirrhosus* **(Spix, 1823)**
Vampyrum **Rafinesque, 1815**
45. *Vampyrum spectrum* **(Linnaeus, 1758)**
Stenodermatinae Gervais, 1856
Artibeus **Leach, 1821**
46. *Artibeus inopinatus* **Davis & Carter, 1964**
47. *Artibeus intermedius* **J.A. Allen, 1897**
48. *Artibeus jamaicensis* **Leach, 1821**
49. *Artibeus lituratus* **(Olfers, 1818)**
Centurio **Gray, 1842**
50. *Centurio senex* **Gray, 1842**
Chiroderma **Peters, 1860**
51. *Chiroderma gorgasi* **Handley, 1960**
52. *Chiroderma salvini* **Dobson, 1878**
53. *Chiroderma villosum* **Peters, 1860**
Dermanura **Gervais, 1856**
54. *Dermanura azteca* **K. Andersen, 1906**
55. *Dermanura phaeotis* **(Miller, 1902)**
56. *Dermanura tolteca* **(Saussure, 1860)**
57. *Dermanura watsoni* **Thomas, 1901**
Ectophylla **H. Allen, 1892**
58. *Ectophylla alba* **H. Allen, 1892**
Enchisthenes **K. Andersen, 1906**
59. *Enchisthenes hartii* **(Thomas, 1892)**
Platyrrhinus **Saussure, 1860**
60. *Platyrrhinus helleri* **(Peters, 1866)**
Sturnira **Gray, 1842**
61. *Sturnira hondurensis* **Goodwin, 1940**
62. *Sturnira parvidens* **Goldman, 1917**
Uroderma **Peters, 1865**
63. *Uroderma convexum* **Lyon, 1902**
64. *Uroderma davisi* **Baker & McDaniel, 1972**
65. *Uroderma magnirostrum* **Davis, 1968**
Vampyressa **Thomas, 1900**
66. *Vampyressa thyone* **Thomas, 1909**
Vampyriscus **Thomas, 1900**
67. *Vampyriscus nymphaea* **(Thomas, 1909)**
Vampyrodes **Thomas, 1900**
68. *Vampyrodes major* **Allen, 1908**
Mormoopidae Saussure, 1860
Mormoops **Leach, 1821**
69. *Mormoops megalophylla* **(Peters, 1864)**
Pteronotus **Gray, 1838**
70. *Pteronotus fulvus* **(Thomas, 1892)**
71. *Pteronotus gymnonotus* **(J.A. Wagner, 1843)**
72. *Pteronotus mesoamericanus* **Smith, 1972**
73. *Pteronotus psilotis* **(Dobson, 1878)**
Noctilionidae Gray, 1821
Noctilio **Linnaeus, 1766**
74. *Noctilio albiventris* **Desmarest, 1818**
75. *Noctilio leporinus* **(Linnaeus, 1758)**
Thyropteridae Miller, 1907
Thyroptera **Spix, 1823**
76. *Thyroptera tricolor* **Spix, 1823**
Natalidae Gray, 1866
Natalus **Gray, 1838**
77. *Natalus lanatus* **Tejedor, 2005**
78. *Natalus mexicanus* **Miller, 1902**
Molossidae Gervais, 1856
Molossinae Gervais, 1856
Cynomops **Thomas, 1920**
79. *Cynomops greenhalli* **Goodwin, 1958**
80. *Cynomops mexicanus* **(Jones & Genoways, 1967)**
Eumops **Miller, 1906**
81. *Eumops auripendulus* **(Shaw, 1800)**
82. *Eumops ferox* **(Gundlach, 1861)**
83. *Eumops hansae* **Sanborn, 1932**
84. *Eumops nanus* **(Miller, 1900)**
85. *Eumops underwoodi* **Goodwin, 1940**
Molossus **É. Geoffroy, 1805**
86. *Molossus alvarezi* **Gonzalez-Ruiz, Ramirez-Pulido & Arroyo-Cabrales, 2011**

87. *Molossus aztecus* **Saussure, 1860**
88. *Molossus bondae* **J.A. Allen, 1904**
89. *Molossus molossus* **(Pallas, 1766)**
90. *Molossus nigricans* **Miller, 1902**
Nyctinomops **Miller, 1902**
91. *Nyctinomops aurispinosus* **(Peale, 1848)**
92. *Nyctinomops laticaudatus* **(E. Geoffroy, 1805)**
93. *Nyctinomops macrotis* **(Gray, 1840)**
Promops **Gervais, 1855**
94. *Promops centralis* **Thomas, 1915**
Tadarida **Rafinesque, 1814**
95. *Tadarida brasiliensis* **(I. Geoffroy, 1824)**
Vespertilionidae Gray, 1821
Myotinae Tate, 1942
Myotis **Kaup, 1829**
96. *Myotis albescens* **(E. Geoffroy, 1806)**
97. *Myotis elegans* **Hall, 1962**
98. *Myotis nigricans* **(Schinz, 1821)**
99. *Myotis pilosatibialis* **LaVal, 1973**
100. *Myotis riparius* **Handley, 1960**
101. *Myotis velifer* **(J. A. Allen, 1890)**
Vespertilioninae Gray, 1821
Bauerus **Van Gelder, 1959**
102. *Bauerus dubiaquercus* **(Van Gelder, 1959)**
Eptesicus **Rafinesque, 1820**
103. *Eptesicus brasiliensis* **(Desmarest, 1819)**
104. *Eptesicus furinalis* **(d'Orbigny, 1847)**
105. *Eptesicus fuscus* **(Beauvois, 1796)**
Lasiurus **Gray, 1831**
106. *Lasiurus cinereus* **(Palisot de Beauvois, 1796)**
107. *Lasiurus ega* **(Gervais, 1856)**
108. *Lasiurus egregius* **(Peters, 1870)**
109. *Lasiurus frantzii* **Peters, 1870**
110. *Lasiurus intermedius* **H. Allen, 1862**
Perimyotis **Menu, 1984**
111. *Perimyotis subflavus* **(F. Cuvier, 1832)**
Rhogeessa **H. Allen, 1866**
112. *Rhogeessa bickhami* **Baird, Marchan-Rivadeneira, Perez & Baker, 2012**
113. *Rhogeessa menchuae* **Baird, Marchan-Rivadeneira, Perez & Baker, 2012**

Specific remarks

Artibeus **Leach, 1821.** Recently, Portillo-Reyes et al. (2019) reported a presumed roosting site of approximately 50 individuals which they identified as *A. inopinatus* (Fig. 1A, B) in southern Honduras, but no criteria for identification were provided. These individuals might have been misidentified considering the difficulty of identification of the four species of large *Artibeus* in Honduras. Moreover, Davis (1970) mentioned that the subspecies (e.g. *Artibeus jamaicensis paulus* Davis, 1970) that occurs on the Pacific versant was smaller than those from the Atlantic versant in Honduras, further complicating identification. However, Portillo-Reyes et al. (2019) noted that the establishment of an Área de Importancia para la Conservacion de Murcielagos (AICOM) is warranted on Isla del Tigre for the conservation of *A. inopinatus*. This is based on three unofficial records in 2016 by the PCMH (Programa de Conservación de Murciélagos en Honduras). Hernández (2015) suggested *A. inopinatus* be considered an endangered species in Honduras, specifically for the loss of its habitat due to anthropogenic causes (e.g. extensive clearing for agriculture, livestock and the general reduction of tropical dry forests in southern Honduras).

Before Mora (2016) and Mora et al. (2018), there were no identification keys for bats in Honduras and most researchers used the keys of other countries, especially those of Mexico (Medellín et al. 2008) and Costa Rica (Timm et al. 1999), which do not include *A. inopinatus*, because it is endemic to Honduras, El Salvador and Nicaragua. Considering the controversial identification of *A. inopinatus*, many researchers could have confused it with certain subspecies of *A. jamaicensis* Leach, 1821 or even with juvenile *A. jamaicensis* or *A. lituratus* (Olfers, 1818). This could be one of the main reasons that *A. inopinatus* has been considered a rare species (see Turcios-Casco et al. 2020c) by Reid (2009) or categorised with deficient data by Reid and Medina (2016). Only in TTU and TCWC we know of 214 and 221 specimens respectively and there are two museum specimen in Honduras, one (CZB–2019–10) in the department of Comayagua (La Carbonera, El Rosario) and one (UVS–V–02063) in the department of Francisco Morazán (Carboneras, Sabanagrande). To our knowledge, the individual captured in San Buenaventura in Francisco Morazán by Turcios-Casco et al. (2020c) is the highest elevational record for the species which was captured at 1435 m a.s.l.

The case of *Artibeus* (sensu lato) has been controversial and York et al. (2019) mentioned an easy distinguishing characteristic between *A. intermedius* and *A. lituratus* (e.g. *A. lituratus* has both pairs of facial stripes distinct and *A. intermedius* only the stripes above eye) in Costa Rica. Simmons (2005) did not recognise *A. intermedius*, because she believed that individuals identified as *A. intermedius* represent individuals of *A. l. palmarum* J. A. Allen & Chapman, 1897 that fall at the lower end of the normal range of size variation for that species. However, we followed Larsen et al. (2013) who suggest that that *A. l. intermedius* in Central America is the product of a recent ecologically-driven Neotropical expansion by *A. lituratus*. In addition, they noted that Davis (1984) and Marchán-Rivadeneira et al. (2012) provided indirect evidence of genetic isolation of *A. intermedius* by identifying sympatric *A. intermedius* and *A. l. palmarum* as morphotypes in Middle America. In conclusion, Larsen et al. (2013) gave concrete information, based on review of previous works plus molecular evidence, that support that *A. intermedius* must be treated as a separate species from *A. lituratus* reinforcing the hypothesis of Davis (1984). Evidence in Honduras supporting occurrence of *A. intermedius* (Davis 1984) is based on the existence of two size classes of *Artibeus lituratus* (sensu lato), a large

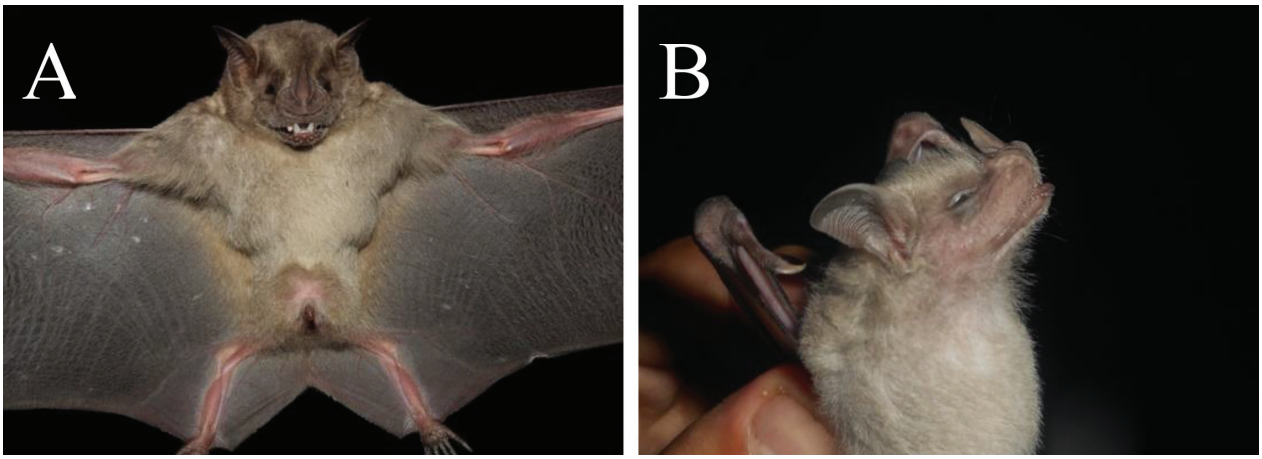

Figure 1. *Artibeus inopinatus*. **A** – Adult male captured in Carboneras, Sabanagrande in the department of Francisco Morazán (center of Honduras). **B** – Adult female captured in Nagarejo, Nacaome in the department of Valle (southern Honduras).

size-class (referring to the formerly *A. lituratus*) and a small size-class (referring to what he hypothesised to be *A. intermedius*) from Santa Bárbara (western Honduras) and Brus Laguna (eastern Honduras). Davis (1984) identified specimens of *A. intermedius* from the following departments of Honduras: Choluteca and Valle in southern Honduras; Copán, Intibucá, La Paz, Ocotepeque and Santa Bárbara in western Honduras; Francisco Morazán and Comayagua in Central Honduras; and Gracias a Dios in eastern Honduras. Additionally, in the GBIF.org (2019), there are preserved specimens from Atlántida, Colón and Cortés deposited at TTU. These specimens from TTU complement the wide distribution of the species in almost all the country, excluding the departments of Lempira, El Paraíso, Yoro, Olancho and Islas de la Bahía. Finally, Simmons and Cirranello (2020) recognised A. *intermedius* as a distinct species from *A. lituratus*.

***Balantiopteryx io* Thomas, 1904**. This species is known from Honduras only by the records of Divoll and Buck (2013) of six individuals (four females and two males) captured in a harp trap on the Masca River, Piedra Chaca in the department of Cortés. It appears there are no Honduran specimens of this species in any museum. The caves, in which these individuals were captured represent, the only known locality for the species in Honduras. *B. io* is classed as Vulnerable (Lim 2015) by the IUCN (International Union for the Conservation of Nature).

***Centronycteris centralis* Thomas, 1912.** This species is included by Rodríguez Herrera and Sánchez (2015) and Mora et al. (2018) for Honduras, even though there is no record of *C. centralis* in the GBIF.org (2019). Goodwin (1942) and McCarthy et al. (1993) placed this species [then referred to as *C. maximilliani* (J. Fischer, 1829)] in the bat list of Honduras with no further details. Although Simmons (2005) and Hood and Gardner (2008) suggest this species occurs in Honduras, there are no published records or museum specimens to back up these assumptions. The only unofficial record was made by Hernández et al. (2016) in which vocalisations of *C. centralis* were recorded in the Cuyamel-Omoa National Park in the department of Cortés, but without a precise location (coordinates and elevation). No further information is known of the species in the country.

***Chiroderma gorgasi* Handley, 1960.** The first record of *C. gorgasi* (UVS–V–02529) for Honduras was collected in 2017 [= referring to *C. trinitatum* by Turcios-Casco et al. (2020a)]. This specimen came from the Caribbean lowlands of the Honduran Mosquitia in the historical city of Ciudad Blanca, in the department of Gracias a Dios. This record is the only one known from northern Central America and represents a range extension of 512 km from Tortuguero, Costa Rica (Turcios-Casco et al. 2020a). However, we followed Lim et al. (2020) and the species that occurs in north-western Ecuador, western Colombia, Panama, Costa Rica and Honduras is *C. gorgasi*.

***Cynomops* Thomas, 1920.** LaVal (1969) reported a lactating female captured in the department of Comayagua as the first record of *Molossops greenhalli* Goodwin & Greenhall, 1958 in Central America. Although the systematics of *Cynomops* (= *Molossops*) have been somewhat problematic, we decided to follow Peters et al. (2002) who stated that *C. greenhalli* Goodwin, 1958 is the species that occurs in Honduras. *C. mexicanus* (Jones & Genoways, 1967) had been previously reported from Honduras, but Peters et al. (2002) restricted *C. mexicanus* to Mexico. Additionally, Peters et al. (2002) suggested that *C. paranus* (Thomas, 1901), *C. planirostris* (Peters, 1865), *C. g. greenhalli* and *C. g. mexicanus* cannot be definitely separated based on size, and this has been one of the main causes of taxonomic confusion within this group. Simmons (2005), amongst others, does not agree with this treatment, but more recent authors [Eger (2008), Moras et al. (2016) and Moras et al. (2018)] recognised *C. greenhalli* and *C. mexicanus* as distinct species. Currently, Simmons and Cirranello (2020) recognised *C. greenhalli* to be distinct from *C. mexicanus*.

Erroneously, the species that had been previously recognised in Honduras was *C. mexicanus* [e.g. Hernández (2015), Mora (2016), Mora et al. (2018)], but to date, the only specimen of *Cynomops* is the female captured in the

Table 1. Comparison of the new record of *C. mexicanus* with the record of LaVal (1969) in the department of Comayagua of *C. greenhalli*, and the measurements presented for both species by Moras et al. (2018). Means (ranges in parentheses); all the measurements are in mm.

	Cynomops mexicanus **(TTU 104070), new record**	***Cynomops mexicanus*** **by Moras et al. (2018)**		***Cynomops greenhalli*** **(TCWC 22123) by LaVal (1969)**	***Cynomops greenhalli*** **by Moras et al. (2018)**	
Sex	1 female	1 male	5 females	1 female	11 males	22 females
FA	36.71	37.05	35.08 (33.02–36.3)	35.7	37.41 (35–39.7)	35.36 (33.40–38.28)
GLS	18.90	18.78	17.02 (15.87–17.57)	19.3	18.41 (17.37–19.23)	17.12 (15.91–17.82)
CIL	17.02	19.39	16.87 (16.05–17.19)	–	18.68 (17.92–19.5)	16.93 (16.06–17.68)
PB	4.07	4.73	4.55 (4.23–4.80)	4.8	4.78 (4.53–5.02)	4.63 (4.29–4.97)
ZB	10.75	13.20	11.76 (11.32–12.00)	12.6	12.77 (12.06–13.65)	11.85 (11.23–12.51)
BB	7.51	9.18	8.75 (8.65–8.92)	–	9.24 (8.68–9.65)	8.86 (8.20–9.25)
MB	8.47	13.16	11.21 (10.71–11.41)	12.1	12.26 (11.9–13.01)	11.24 (10.49–11.86)
MTL	5.80	7.62	6.79 (6.38–6.92)	7.2	7.18 (6.79–7.67)	6.61 (6.22–7.05)

department of Comayagua by LaVal (1969) which is *C. greenhalli* and not *C. mexicanus*. Additionally, there is a record of *C. greenhalli* (TCWC 24178) from Lancetilla, 40 m a.s.l., in the department of Atlántida (Valdez and LaVal 1969; Prestridge 2019b).

Table 1 shows a morphometric comparison amongst other Central American specimens plus that of the female misidentified as *C. greenhalli* (TTU 104070) that was captured by R. D. Bradley et al. in 2004, in the SAG, La Ceiba, in the department of Atlántida in northern Honduras (not Colón, as is incorrectly recorded on the original label). The specimen (TTU 104070) was identified as *C. mexicanus* (Fig. 2A–C) following Moras et al. (2018), for the following reasons: 1) forearm shorter than 40.0 mm; 2) the rostrum was relatively low; 3) the anterior face of the lacrimal ridges sloping smoothly to the forehead; 4) incisive and accessory foramina arranged in the shape of an equilateral triangle instead of an isosceles triangle when viewed from above. Other measurements (in mm) of specimen TTU 104070 are TL = 93.0, T = 26.0, HF = 6.0, Th = 4.11, CCL = 16.54 and MTL = 7.93.

***Diaemus youngii* (Jentink, 1893).** Amongst the three haematophagous species, *D. youngii* (Fig. 3A–C) was the only species never officially recorded from Honduras. We now document its occurrence in the country. During a survey in November 2018, in Finca Don Richard in Trujillo, in the department of Colón (15.916N, 85.934W, Fig. 7), we captured an adult female at 22:00 h along with individuals of *A. jamaicensis*, *A. lituratus*, *Desmodus rotundus* (E. Geoffroy, 1810), *Micronycteris microtis* (Miller, 1898) and *S. parvidens*. Unfortunately, the individual escaped after chewing the bag in which it was held. However, the individual was already identified and its morphometric data and photographs had been taken: FA = 55.40; E = 15.75; Tr = 7.20; TrW = 2.60; Th = 11.70; Tib = 24.60; HF = 15.95; HB = 73.80; Hu = 53.10; 1ph = 11.50; 2ph = 28.65; 3ph = 22.05; WS = 450.2 mm. The individual was identified as *D. youngii* following Timm et al. (1999), Reid (2009) and Mora (2016): 1) ears triangular; facial and dorsal colour grey brown and lightly frosted; ventrum whitish (Fig. 3A), uropatagium reduced and hairy; and submandibular glands present as mentioned by Medina-Fitoria (2014); 2) wingtips white (Fig. 3B); 3) only one pad at the base of the thumb (Fig. 3C); 4) obvious large glands in the mouth. See Simmons and Cirranello (2020) for a discussion of the correct epithet, which is *youngii*.

***Eptesicus* Rafinesque, 1820.** When Davis (1965) reviewed the *E. brasiliensis* complex, he mentioned that there is a population in the highlands of Middle America that appears to be identical to *E. andinus* from the highlands of Colombia and described the *E. andinus* group (*E. chiriquinus*, *E. inca* O. Thomas, 1920, *E. montosus* O. Thomas, 1920) as having soft pelage and long forearm (43–48 mm). Davis (1966) mentioned that *E. andinus* occurs from the Chiapas Highlands to the highlands of Colombia and Ecuador. Simmons and Voss (1998) noted that Davis (1966) considered *E. chiriquinus* and *E. inca* to be strict junior synonyms of *E. andinus* and Koopman (1978, 1993, 1994) considered *E. andinus* as a subspecies to *E. brasiliensis* and *E. chiralensis* H. E. Anthony, 1926 and *E. montosus* to *E. furinalis* (d'Orbigny, 1847). Simmons and Voss (1998), in accordance with Davis (1966), concluded that *E. inca* and *E. chiriquinus* are conspecific and selected *chiriquinus* as the senior synonym and provided a new diagnosis for the species. Davis and Gardner (2008) revised the genus *Eptesicus* for South America, restricted *E. andinus* from the highlands of Bolivia northwards at upper elevations along the Andes of Peru, Ecuador and Colombia, into north-western Venezuela with no details of distributions in Central America. On the other hand, Davis and Gardner (2008) stated that *E. chiriquinus* occurred at moderate to lower elevation in Colombia, Venezuela, the Guianas, Brazil and eastern Ecuador, Peru and Bolivia and elsewhere in Central America north-westwards into the Chiapan Highlands of Mexico. While reviewing the systematics of the *E. andinus* group, we encountered no mention of an adult female (TTU 104074) misidentified as *Eptesicus andinus* by R. D. Bradley et al. (Garner 2016a) which was captured in 2004 at S.A.G. Laboratorio, La Ceiba, in the department of Atlántida (not Colon, as is incorrectly recorded on the original label) in Honduras. We corroborate the identification of this specimen with the identification keys for *Eptesicus* in Central America of Davis (1966), the new diagnosis of *E. chiriquinus* by Simmons and Voss (1998),

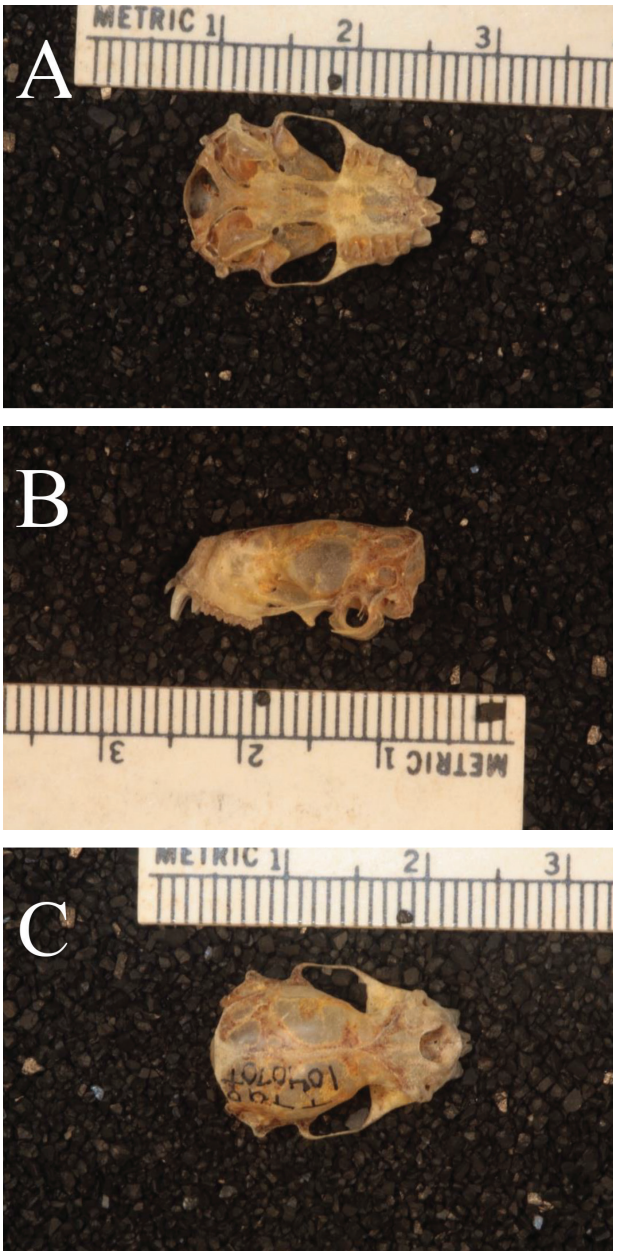

Figure 2. A ventral, **B** lateral and **C** dorsal views of the skull of *C. mexicanus* (TTU 104070) captured in the SAG, La Ceiba in the deparment of Atlántida in northern Honduras.

the key to Costa Rican and Nicaraguan bats (York et al. 2019) and the keys for *Eptesicus* in South America by Davis and Gardner (2008). There is no clarification that the specimen of *E. andinus* [collected at approximately 1.8 miles (ca. 1.6 km) west in Ixhuatan, Chiapas, Mexico by M. D. Tuttle in 1962 (AMNH 203916)] mentioned by Davis (1966) and available in the GBIF.org database (Trombone 2016) corresponds to that species [see Arroyo-Cabrales et al. (2008)]. This individual supports the supposed distribution of *E. chiriquinus* to Chiapas, Mexico. Arroyo-Cabrales et al. (2008) mentioned a personal communication of R. A. Medellín in 1998 stating that one individual of *E. furinalis gaumeri* (J. A. Allen, 1897) from Jalcocotán, captured in the field in January of 1977, belongs to *E. chiriquinus* according to the shape of the interorbital region. Recently, there is personal comment by A. Gardner in Reid (2009) regarding the distribution of *E. chiriquinus*, in which the species may occur in the highlands of Chiapas. However, the specimen AMNH 203916 must be verified to determine which species is the one that occurs in Mexico. We identified the specimen TTU 104074 as *E. furinalis* and not *E. andinus* following Davis and Gardner (2008) and York et al. (2019), because 1) the FA was 39.27 mm; 2) dorsal fur was 7.0 mm with a pale greyish-brown with black basal band; 3) it was collected at low elevations; 4) GSL > 15.00 mm; and 5) MDTL > 5.40 mm.

E. brasiliensis was not included by McCarthy et al. (1993) for Central America and there is no voucher in the GBIF.org (2019) that supports its occurrence in Honduras. Nevertheless, the species is included on the bat list for Honduras by Rodríguez Herrera and Sánchez (2015) and Mora et al. (2018). Espinal and Mora (2012b) recorded a female of *E. brasiliensis* captured in El Corpus, department of Choluteca (southern Honduras), which was preserved, but unfortunately, it is part of a personal collection and is not deposited as a voucher in any museum. Identification was supported by vocalisations recorded to individuals of *E. brasiliensis* during the same survey. For comparison, one of us (LaVal) has recorded echolocation calls of this species at 27 of 59 localities in the Costa Rican Highlands and also in the Pacific and Caribbean Lowlands. This may well be a widespread species in Honduras, but more echolocation recordings are needed.

In conclusion, there are only three species of *Eptesicus* (*E. brasiliensis*, *E. furinalis* and *E. fuscus* Beauvois, 1796) reported for Honduras and, even though Davis and Gardner (2008) stated that *E. chiriquinus* may occur in Honduras, there is no evidence in the country.

***Glyphonycteris* Thomas, 1896.** We did not find any specimens in GBIF.org (2019) of the genus but both species are included by Rodríguez Herrera and Sánchez (2015) and Mora et al. (2018) in the bat lists of Honduras. McCarthy et al. (1993) mentioned that D. C. Carter captured an individual of unknown sex of *G. daviesi* (Hill, 1964) (originally described as *Barticonycteris daviesi*) on the Perlas River where a trail to Valencia on the Patuca River crosses the river near Catacamas, in the department of Olancho. In April 1967, one of us (LaVal), who had actually captured the bat while netting with Carter, observed it as it escaped after chewing a hole in the bag in which it was held. Fortunately, the bat was already tentatively identified by D. C. Carter and photographed by LaVal [stored in the Mammal Slide Library (no. 378) of the American Society of Mammalogists]. McCarthy et al. (1993) also mentioned six individuals [one male and five females: FA = 41.9 mm (41.1–43.3 mm)] of *G. sylvestris* Thomas, 1896 (previously referred as *Micronycteris sylvestris*) captured in Laguna de Bacalar in the department of Gracias a Dios by B. H. Gaskell on 7 October 1982. Unfortunately, specimens were not retained and besides the locality, measurements taken of individuals are the

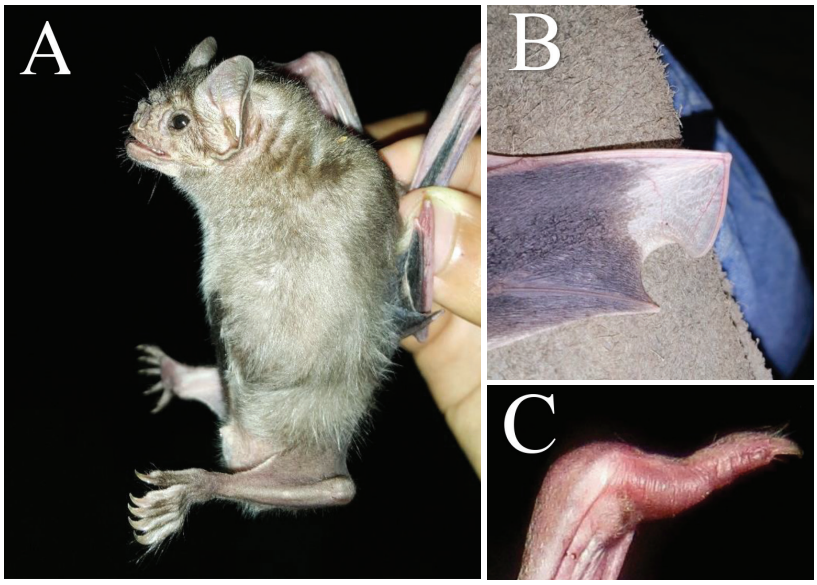

Figure 3. *Diaemus youngii*. **A** – Frosted brownish venter; **B** – Whitish tip of the wings; **C** – One pad on the base of the thumb.

only information we have for the species in Honduras. These sparse records are all from the Caribbean Lowlands in the north-eastern part of the country.

***Hylonycteris underwoodi* Thomas, 1903.** The occurrence of *H. underwoodi* has been debated, because there are no vouchers that can confirm presence in Honduras. Turcios-Casco and Medina-Fitoria (2019) confirmed occurrence of the species in Honduras, based on an adult female (UVS–V–02527) captured in the department of Gracias a Dios in eastern Honduras.

***Lasiurus* Gray, 1831.** Mora and López (2013) described the first record of *L. cinereus* (Palisot de Beauvois, 1796) (EAPZ–06), based on a male specimen found dead in Cerro de Hula in Santa Ana municipality in southern Francisco Morazán at 1658 m a.s.l. There is only one more record of the species in Honduras by Espinal and Mora (2012a), based on audio recordings from San Marcos de Colón, in the department of Choluteca in southern Honduras. Mora (2012) recorded *Lasiurus egregius* (Peters, 1870) for the first time in Honduras, based on two specimens, a male (UCR 2067) and a female (UNAH 1456) captured during the night of 9 May 1998 in Catacamas, department of Olancho (north-eastern Honduras). These records cover a gap between Guatemala and Panama (see Mora (2012) for more details). In addition, based on Baird et al. (2015), the species that occur in Central America (see York et al. 2019) is *L. frantzii* Peters, 1870 and not *L. blossevillii* (Lesson & Garnot, 1826), as is mentioned by Mora et al. (2018).

***Leptonycteris yerbabuenae* Martínez and Villa-R, 1940.** We followed Cole and Wilson (2006a, 2006b), when recognising occurrence in Honduras of *L. yerbabuenae*. This distinction is well supported by published data (Wilkinson and Fleming 1996), in which *L. curasoae* Miller, 1900 and *L. yerbabuenae* separated approximately 540,000 years ago. In 1991, R. D. Bradley reported two specimens (TTU 61087, TTU 61088) from Nacaome, in the department of Valle. Lee and Bradley (1992) reported three additional individuals [(TCWC 49747–49749) (GBIF.org 2019, Fig. 7). More recently in 1995, M. Sandiford reported one more individual (ZD 1999.194) from Yusguare, in the department of Choluteca (GBIF.org 2019, Fig. 7). Even though there are two records in the GBIF.org database, in the catalogue presented by the Natural History Museum (London) (2019), there is only the one individual captured by M. Sandiford in 1995. *L. yerbabuenae* is known only from southern Honduras in the departments of Choluteca and Valle. Hernández (2015) proposed the creation of the Área de Importancia para la Conservacion de Murcielagos (AICOM) Golfo de Fonseca for the conservation of *L. yerbabuenae*. Its rarity in Central America is one of the reasons that this species is considered as Near Threatened (NT) by the IUCN. In Table 2, we give cranial measurements for Bradley's records.

***Lonchorhina* Tomes, 1863, *Mimon* Gray, 1847, *Phylloderma* Peters, 1865 and *Tonatia* Gray, 1827.** A seventh locality of *L. aurita* Tomes, 1863 (UVS–V–02067, UVS–V–02075) was reported by Ávila-Palma et al. (2020) in Sabanagrande in the department of Francisco Morazán. Ávila-Palma et al. (2019) reported *M. cozumelae* (UVS–V–02059) at two sites in the core of the Río Plátano Biosphere Reserve in the department of Colón. These records represent the fifth and sixth localities of this species in Honduras and the first record since 2001. A new record of *Phylloderma stenops* (UVS–V–02526) was obtained after 46 years by Turcios-Casco et al. (2020b) in the Caribbean Lowlands of the department of Gracias a Dios in eastern Honduras. Regarding *Tonatia*, we follow Basantes et al. (2020). The species that occurs in Honduras is *T. bakeri* Williams, Willig & Reid, 1995 and *T. saurophila* Koopman & Williams, 1951 is only known, based on subfossil remains found in caves of the type locality in Jamaica.

***Molossus*.** Goodwin (1942) gave the first records of *Molossus bondae* J.A. Allen in the department of La Paz, north-western Honduras. Dolan (1989) considered *M. bondae* to occur in Honduras, specifying that the species was known with certainty from Brus Laguna, in the department of Gracias a Dios in north-eastern Honduras, but LaVal (1977) stated that the individuals mentioned by Goodwin (1942) were not *M. bondae*, based on his personal examination of the specimens. McCarthy et al. (1993) considered Honduras as the northernmost country for the occurrence of *M. bondae* and consequently Burnett et al. (2001), Reid (2009), Hernández (2015), Mora (2016) and Mora et al. (2018) all listed *M. bondae* as occurring in Honduras. Additionally, López-González and Presley (2001) indicated that *M. currentium* Thomas, 1901 has priority over *M. bondae*. Although differences exist in cranial and external measurements in South and Central American individuals, the populations are sufficiently similar that they considered them to be conspecific, based on morphometric data.

Eger (2008) believed that *M. bondae* and *M. currentium* were different species due to differences in colouration and fur length. However, we follow Loureiro et al. (2020) as the most recent taxonomy for *Molossus*, based on Dolan (1989) and González-Ruiz et al. (2011). We recognise 14 species of *Molossus*, based on Loureiro et al. (2020), including *M. bondae*, the species that occurs in Central America, and *M. currentium* restricted to South America. This species has its northern limit in Brus Laguna in the department of Gracias a Dios in north-eastern Honduras (Dolan and Carter 1979; Dolan 1989; López-González and Presley 2001); these reports are the only ones that are known for Honduras, although there is an old record by R. W. Adams of 1963, from Río Coco, in the department of El Paraíso in south-eastern Honduras (GBIF.org 2019).

Simmons and Cirranello (2020) mentioned that Loureiro et al. (2020) considered some specimens of *M. sinaloae* J. A. Allen, 1906 from Honduras to be *M. alvarezi* Gonzalez-Ruiz, Ramirez-Pulido & Arroyo-Cabrales, 2011. There has not been any doubt about the occurrence of *M. molossus* (Pallas, 1766) in the country. On the other hand, we consider *M. aztecus* Saussure, 1860 to occur in Honduras, because McCarthy et al. (1993) referred to two males captured in the department of La Paz in western Honduras. Additionally, Loureiro et al. (2020) and Simmons and Cirranello (2020) consider its occurrence in Jalisco and Cozumel in Mexico to Nicaragua, southern Venezuela, and south-eastern Brazil. Finally, *M. nigricans* Miller, 1902 is the species that occur in Mexico and Central America and *M. rufus* É. Geoffroy, 1805 is restricted to South America including Guianas, Ecuador, Peru, to central and northern Brazil and Bolivia, and Trinidad and Tobago (Loureiro et al. 2020; Simmons and Cirranello 2020).

Table 2. Cranial measurements (in mm) of the two individuals of *L. yerbabuenae* recorded in 1991 by R. D. Bradley et al. in the department of Valle, southern Honduras (Garner 2016b, 2016c). The records of Cole and Wilson (2006a) are from southern Arizona and Mexico (means before parentheses and ranges are included on them).

	TCWC 49749	TCWC 49748	Cole and Wilson (2006a)	Cole and Wilson (2006a)
Sex	Male	Male	10 males	10 females
GLS	26.68	27.65	26.8 (26.0–27.3)	26.8 (26.4–27.3)
CIL	26.14	27.04	–	–
PB	5.35	5.25	–	–
ZB	10.75	11.16	11.1 (10.7–11.5)	10.8 (10.6–10.9)
BB	9.66	10.39	–	–
MB	10.85	11.06	10.3 (10.1–10.6)	10.3 (10.1–10.5)
MBL	8.86	8.72	9.6 (9.2–9.8)	9.5 (9.0–9.9)
CCL	25.09	25.69	–	–
MDTL	9.46	9.86	–	–

***Myotis pilosatibialis* LaVal, 1973.** Mantilla-Meluk and Muñoz-Garay (2014) elevated *M. keaysi pilosatibialis* to species and they included new discrete characters distinguishing *M. pilosatibialis* from *M. keaysi* J. A. Allen, 1914 which is considered a similar species. In agreement with York et al. (2019), we consider *M. pilosatibialis* (Holotype: LACM 36879) to be the species that occurs in Central America. The type locality is a small cave 1 km west of Talanga, in the department of Francisco Morazán (750 m a.s.l.) in central Honduras (LaVal 1973). According to LaVal (1973), he collected the holotype and the large series of topotypes from a cluster of several hundred bats in a small domed room not far from the entrance of the cave. This species is known from few Honduran localities besides the type locality, based on the GBIF.org (2019): 8.5 miles (ca. 12.9 km) south-west San Lorenzo in the department of Valle (southern Honduras); 49.89 km north in the department of Santa Bárbara (western Honduras); and at 31.8 miles (ca. 50 km) east southeast of Cuyamel, Santo Domingo in the department of Cortés (northern Honduras). Notably, LaVal (1973) mentioned that almost all specimens from Honduras were from elevations of 1000 to 2000 m a.s.l.

***Natalus lanatus* Tejedor, 2005 and *N. mexicanus* Miller, 1902.** Tejedor (2011) examined two specimens from Honduras and identified them as *N. mexicanus*, one captured in La Tigra National Park, in the department of Francisco Morazán (TTU 83664) in Central Honduras and the other at 12 km north of Santa Bárbara (TTU 13418) in western Honduras [this record was considered as a complex by Turcios-Casco et al. (2019a), because *N. mexicanus* was previously included in *N. stramineus* Gray, 1838]. Recently, Miller (2014) reported individuals of *N. mexicanus* from Honduras, but no vouchers were collected. *N. lanatus* was considered an expected species in Honduras (Mora 2016; Mora et al. 2018), based on records in Mexico (Tejedor 2011), Nicaragua (Medina-Fitoria et al. 2015) and Costa Rica (Rodríguez Herrera et al. 2011). The occurrence of *N. lanatus* in Honduras is based on two historical specimens that we re-examined and identified as *N. lanatus* (TCWC 10992 and TCWC 11008), respectively, captured by J. R. Meyer in 1963 at 6 miles (ca. 9.6 km) north of Zamorano, Francisco Morazán

, and by J. V. Mankins, at 2 mi (ca. 3.2 km) W Cueva del Viejo, La Paz in 1963 (Fig. 7).

We identified the two individuals (TCWC 10992 and TCWC 11008) as *N. lanatus* following Tejedor (2011): (1) bicoloured ventral pelage (Fig. 4C); (2) hairy legs and feet with ungual tufts [Fig. 5A, see comparison with feet of *N. mexicanus* (Fig. 5B of individual TCWC 19698)]; (3) GSL = 16.2–16.5; (4) BB = 7.9–8.0; (5) MTL = 6.7–6.9; (6) the caudal margins of the maxilla have a shallow perpendicular to longitudinal axis of the skull; (7) margins of the ears were straight. See Table 3 for comparison with individuals mentioned by Tejedor (2011), Rodríguez Herrera et al. (2011) and Medina-Fitoria et al. (2015). These two specimens confirm the presence of *N. lanatus* in Honduras and help fill the gap between Mexico and Nicaragua. *N. lanatus* is the second species of the genus known for the country, although it was expected by Mora et al. (2018).

***Nyctinomops* Miller 1902.** McCarthy et al. (1993) included only *N. laticaudatus* (E. Geoffroy, 1805) for Honduras, based on a record of a female [TCWC 19759 (Prestridge 2019a] captured by LaVal on the Aguán River in the department of Yoro (northern Honduras) and constitutes the only record known for the species in Honduras. Mora et al. (2016) confirmed the presence of *N. macrotis* (Gray, 1840) with two males (MVB 4962, MVB 4963) captured in San Marcos de Colón and El Corpus in the department of Choluteca (southern Honduras). Additionally, Espinal et al. (2016) reported a dead male of *N. aurispinosus* (Peale, 1848) also from San Marcos de Colón. Unfortunately, even though they gave morphometric information and stated that the specimen was preserved in fluids, no catalogue number was listed, and we cannot find the individual (to our knowledge it has not been deposited in any museum collection).

***Sturnira* Gray, 1842.** We re-examined the specimens PSM 13753 and PSM 13754 that were misidentified as *S. bogotensis* Shamel, 1927. After reviewing individuals and analysing the mensural and cranial characteristics, we corroborate the specimens as *S. hondurensis*. Both individuals had bilobed lower incisors, forearm lengths greater than 43 mm, dark brown colouration and were captured in La Esperanza, in the department of Intibucá, which is over 1000 m a.s.l. Following Velazco and Patterson (2013), the only two species that occur in Honduras are *S. parvidens* and *S. hondurensis*.

***Thyroptera* Spix, 1823.** Goodwin (1942) considered the type locality of *T. discifera* (Lichtenstein & Peters, 1854) as Puerto Caballos, department of Cortés, Honduras. However, Wilson (2008) clarified that, although many researchers assumed the type locality of *T. discifera* (Fig. 6A, B) to be in Honduras, the correct type locality is Puerto Cabello, Carabobo, Venezuela. See Turcios-Casco and Medina-Fitoria (2019) for a detailed occurrence of *T. tricolor* Spix, 1823 (UVS–V–02525, UVS–V–02532, UVS–V–02533) in Honduras, which re-

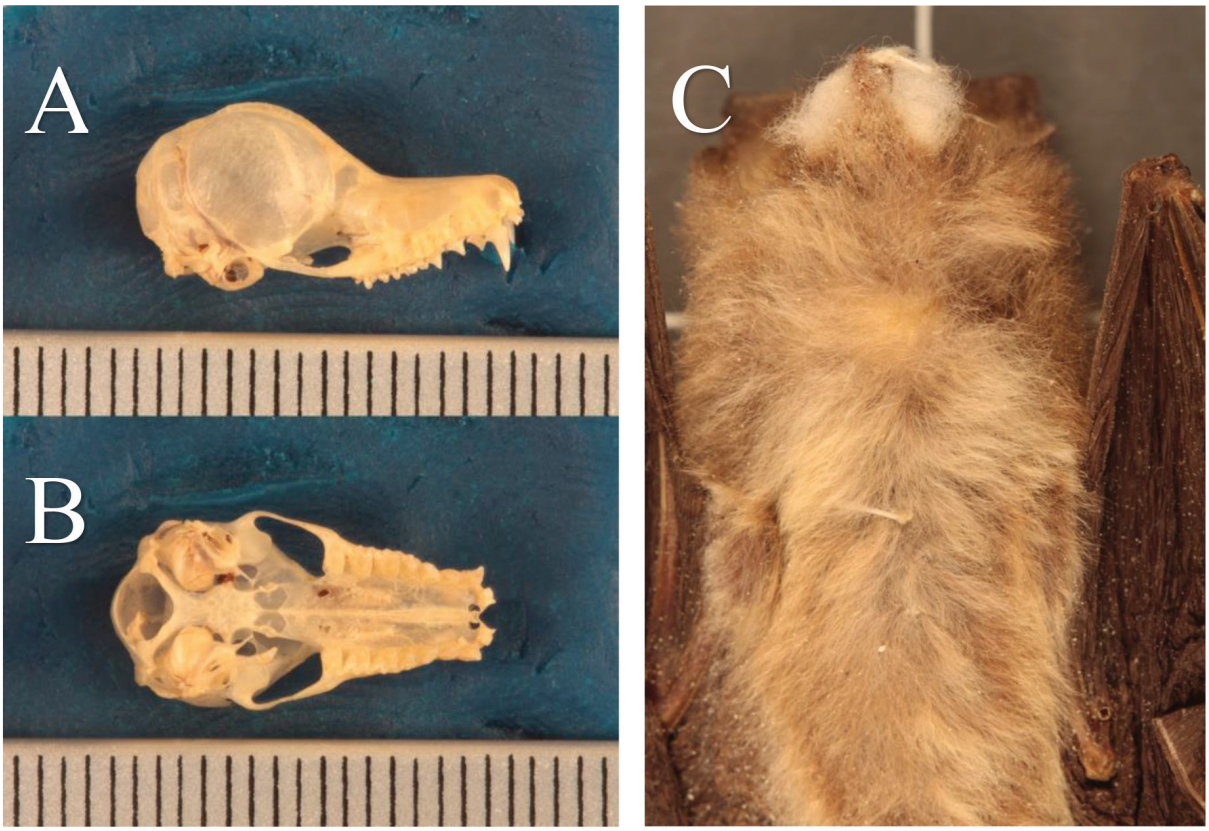

Figure 4. A Lateral and **B** ventral views of the skull of *Natalus lanatus* (TCWC 10992) captured in Zamorano in department of Francisco Morazán, August 1963. **C** Bicolor ventral pelage of *N. lanatus* of the same specimen.

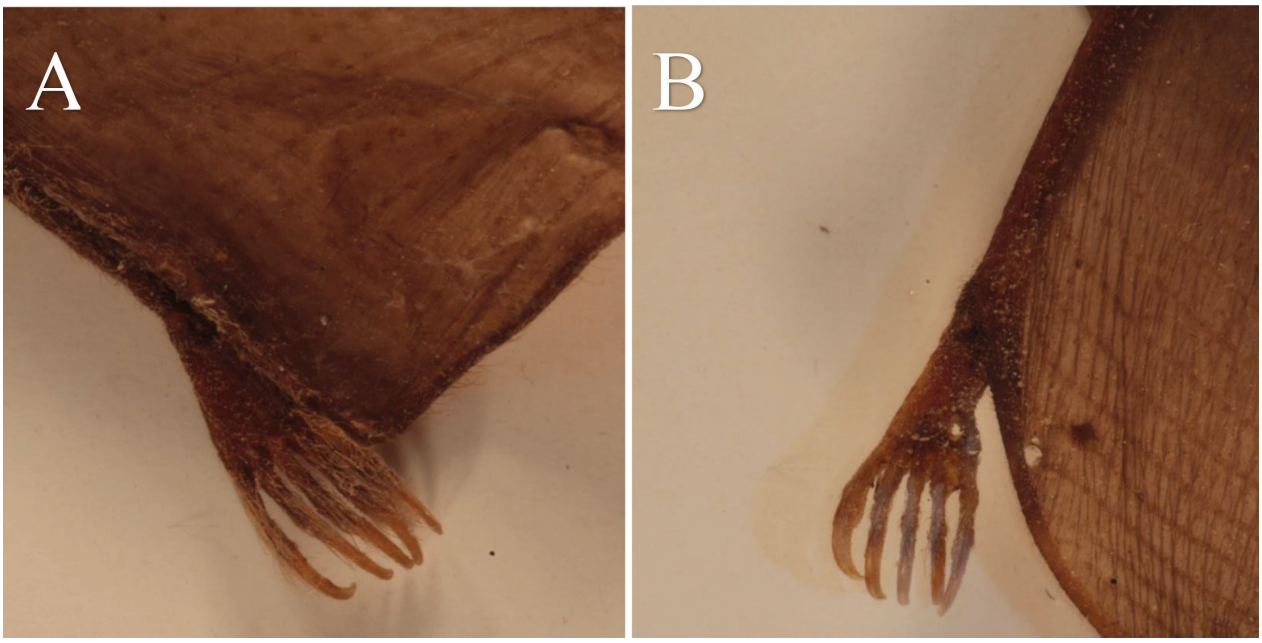

Figure 5. A – Ungual tufts of *N. lanatus* (TCWC 10992) and **B** – Naked feet of *N. mexicanus* (TCWC 19698).

Figure 6. A – Roost of *Thyroptera discifera* in a (Musaceae) from the Caribbean lowlands of Costa Rica. **B** – View of the colony *T. discifera* inside the leaves of *Musa* × *acuminata*. Photos by Bernal Rodríguez.

cently is only known in the department of Gracias a Dios (eastern Honduras). There are historical records in the departments of Francisco Morazán (Goodwin 1942) and Cortés (Hall 1981). The distribution of *T. tricolor* in Honduras has likely been affected by deforestation, excessive exploitation of resources, changes in land use and livestock grazing (Turcios-Casco and Medina-Fitoria 2019; Larsen 2019). As York et al. (2019) included *T. discifera* in Nicaragua and Costa Rica, we can expect to encounter this species in Honduras. More sampling effort is needed

Table 3. Comparison of *N. lanatus* specimens that comprise new records for Honduras with individuals captured by Tejedor (2011) in Mexico, Nicaragua (Medina-Fitoria et al. 2015), and Costa Rica (Rodríguez Herrera et al. 2011). Means (ranges in parentheses); all the measurements are in mm.

	TCWC 10992	TCWC 11008	Individuals mentioned by Tejedor (2011)		Rodríguez Herrera et al. (2011)	Medina-Fitoria et al. (2015)
Sex	M	F	females	males	male	undetermined
FA	38	40	36.8 (35.4–38.6)	37.0 (35.4–38.3)	39.0	36.5–37
Ti	19	17	16.5 (15.9–17.3)	16.8 (15.5–18.4)	–	–
3mt	34	35	32.6 (31.2–33.9)	33.0 (32.0–33.8)	–	–
5mt	36	37	34.2 (33.2–35.5)	34.2 (33.2–34.9)	–	–
E	15	14	13.9 (13.0–15.3)	14.1 (12.0–15.6)	16.0	14.5–14.5
GSL	16.5	16.2	15.8 (15.3–16.2)	16.0 (15.4–16.4)	–	–
ZB	8.4	8.3	8.1 (7.9–8.3)	8.2 (7.8–8.7)	–	–
BB	7.9	8.0	7.7 (7.6–7.9)	7.9 (7.5–8.2)	–	–
BAM	5.7	5.5	5.4 (5.2–5.5)	5.4 (5.2–5.6)	–	–
BAC	3.9	4.2	3.5 (3.4–3.6)	3.6 (3.5–3.8)	–	–
MTL	6.9	6.7	6.5 (6.3–6.8)	6.7 (6.4–6.9)	–	–
MBL	7.0	6.8	6.9 (6.7–7.2)	7.1 (6.9–7.4)	–	–
PB	3.4	3.4	3.2 (3.1–3.3)	3.2 (3.1–3.3)	–	–

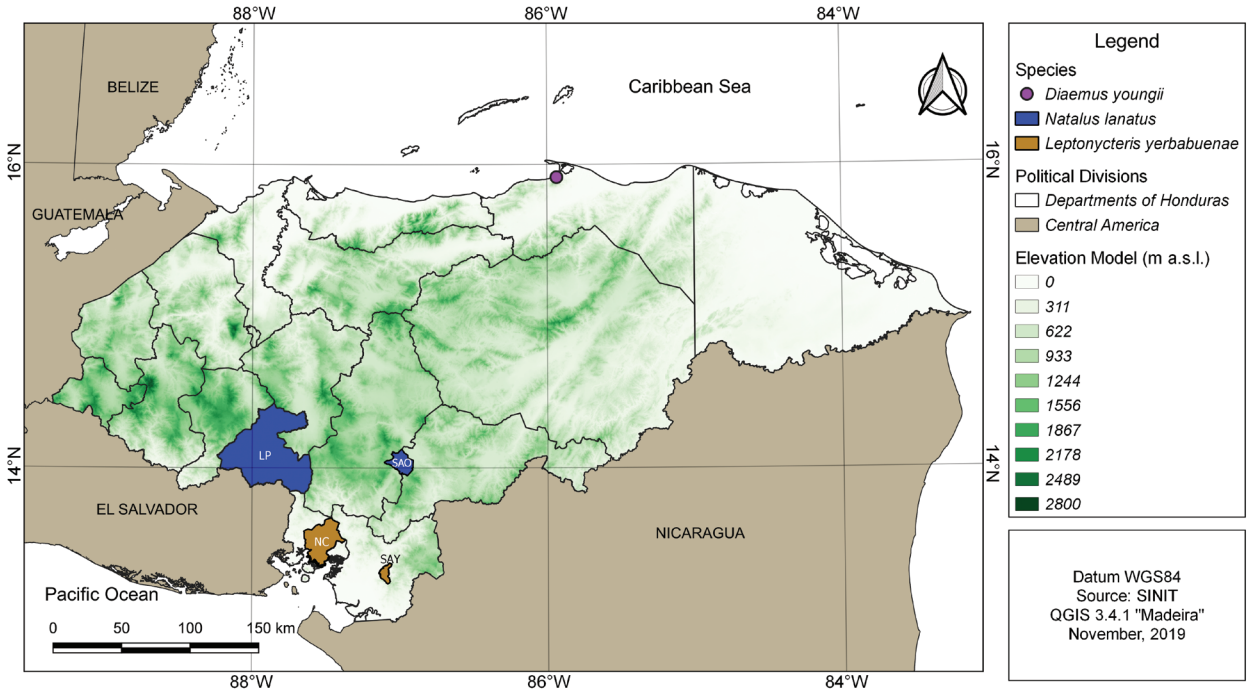

Figure 7. Map with new records of *D. youngii* and *N. lanatus* for Honduras. None of the previous records (except *D. youngii*) have exact coordinates, however, we shaded the municipality on each department in which they were recorded. The blue shaded area indicates the localities of *N. lanatus* captured in the municipality of Zamorano (municipality of San Antonio de Oriente) in the department of Francisco Morazán in central Honduras, and in La Cueva del Viejo in the department of La Paz in western Honduras. The big yellow-shaded area refers to two localities in which *L. yerbabuenae* was recorded in the municipality of Nacaome in the department of Valle in southern Honduras by Lee and Bradley (1992) and R. D. Bradley in 1991 (GBIF.org 2019). The small brown-shaded areas in southern Honduras refer to the localities in which M. Sandiford reported one *L. yerbabuenae* from the municipality of Santa Ana de Yusguare in the department of Choluteca (GBIF.org 2019). Finally, the purple point refers to the exact location of *D. youngii* recorded in the department of Colón in northeastern Honduras. Abbreviations as follows: La Paz (LP), Nacaome (NC), San Antonio de Oriente (SAO), and Santa Ana de Yusguare (SAY). There is no specific area highlighted in La Paz because there are several caves known as Cueva del Viejo.

to study roosting sites of bats in general. For example, *T. tricolor* probably uses banana leaves, as they do in Costa Rica, as well as *Heliconia* leaves, which are abundant plants in wet forests and disturbed and secondary forests (Rodríguez et al. 2007).

***Vampyriscus nymphaea* (Thomas, 1909).** Mora et al. (2014) confirmed the presence of this species, based on a pregnant female (EAPZ 72) from the Coco River in Nueva Esperanza, in the Patuca National Park, in the department of Olancho (north-eastern Honduras).

Discussion

Although Honduras is a region in Mesoamerica of high biodiversity (McCranie et al. 2018; Larsen 2019), there are many mammalian groups that have been poorly studied (e.g. Chiroptera, Didelphimorphia, Rodentia and Xenarthra). Since the 1900s, the number of bat species in Honduras has been debated. After a careful review of recent taxonomic proposals and museum specimens, we confirm that there are 113 species in Honduras, plus seven expected. This makes Honduras the second most diverse country in Central America in number of bat species, just below Costa Rica which has, as of now, 120 recorded species (York et al. 2019) and above Nicaragua, with 111 species considering Medina-Fitoria and Martínez-Fonseca (2019) and Saldaña Tapia et al. (2020).

We augmented the most recent bat list of Honduras (Mora et al. 2018) by confirming the presence of *D. youngii* and *C. greenhalli* and with the new record of *N. lanatus*. The species that occur in Honduras, based on new taxonomic arrangements in addition to Mora et al. (2018), are *A. intermedius*, *C. gorgasi*, *C. greenhalli*, *E. ferox*, *G. keenani*, *L. frantzii*, *M. pilosatibialis*, *M. alvarezi*, *M. nigricans*, *P. fulvus*, *P. psilotis* and *T. bakeri*. The seven expected species, based on occurrence in neighbouring countries and consideration of previous authors, are *Cormura brevirostris* (Wagner, 1843), *L. brachyotis*, *Mesophylla macconnelli* Thomas, 1901, *M. coibensis* J. A. Allen, 1904, *M. pretiosus* Miller, 1902, *T. discifera* and *Trinycteris nicefori* (Sanborn, 1949). The occurrence of *E. bonariensis* in Honduras has been controversial, because Jones et al. (1977) included it for Central America and Simmons (2005) listed the occurrence of the species as from Mexico to Peru, Argentina, Paraguay, Uruguay and Brazil. However, the species is currently restricted to South America (Wilson and Mittermeier 2019). In addition, we considered *M. pretiosus* of expected occurrence, because it was included by Jones et al. (1988) and more recently by Wilson and Mittermeier (2019) to occur in Central America. Although Jones et al. (1977) and Simmons (2005) have suggested that *E. perotis* (Schinz, 1821) occurs in Honduras, we remain unconvinced, because there are no verified records from any Central American country. We did not consider the occurrence of *M. coibensis* in Honduras, Mora et al. (2018) considered it in southern Honduras, because there is no veridical evidence of its occurrence in the country. Additionally, Lourerio et al. (2020) and Simmons and Cirranello (2020) mentioned that the distribution of *M. coibensis* is from México to South America.

Although there is no voucher of *D. youngii* from Honduras, we presented external measurements, ecological data and photos of a Honduran specimen, so now all three haematophagous species in America are confirmed for Honduras. This is the only record of *D. youngii* in Honduras, indicating that more sampling effort is needed to determine the distribution of the species in the country, but based on its frequency of occurrence elsewhere, *D. youngii* is the rarest of the desmodontinae species.

The following species are based on historical records only; in spite of our substantial effort since the 2000s, we do not know of any recent records (even unofficial) of the following species: *C. mexicana*, *G. keenani*, *G. daviesi*, *G. sylvestris*, *L. yerbabuenae*, *L. obscura*, *M. macrophyllum* and *V. major*. We strongly recommend a revision of the threatened species list proposed by Hernández (2015) and that it consider some of the previous species which are only known from the historical record in Honduras. The cases of *C. centralis*, *B. io*, *G. daviesi* and *G. sylvestris* are also controversial and very similar to the case of *D. youngii*, because their occurrence in Honduras has been upheld with no museum specimens.

Our acceptance of not dividing *Lasiurus* into three genera: *Lasiurus*, *Aeorestes* and *Dasypterus* (Baird et al. 2015, 2017) or of using *Dermanura* for some species formerly in the genus *Artibeus* (Cirranello et al. 2016; Simmons and Cirranello 2020) will not affect the real number of bat species in Honduras. York et al. (2019) reported the occurrence of *A. intermedius* in Nicaragua and Costa Rica. Larsen et al. (2013) gave evidence to support the hypothesis of Davis (1984) and recognised *A. intermedius* as a different species from *A. lituratus*. Based on the revision of Davis (1984), the occurrence of *A. intermedius* in Honduras is well supported. Another species, formerly considered rare, was *A. inopinatus* (Reid 2009; Medina and Reid 2016; Portillo-Reyes et al. 2019). Nonetheless, between 1966 and 2001, there were 422 records of *A. inopinatus* for Honduras [not 454 records as erroneously mentioned by Portillo-Reyes et al. (2019)] (Turcios-Casco et al. 2020c); in fact, there are 193 just at TTU. In addition, there are 21 for El Salvador and 11 for Nicaragua in the database of GBIF.org (2019). This suggests that the species is relatively common in several areas of Honduras, although there has been little sampling reported for Honduras since 2001. For a recent example, in the department of Francisco Morazán, Sabanagrande [also an important site for the conservation of *L. aurita* (Ávila-Palma et al. 2020)], *A. inopinatus* comprised 64% of one night's catch in August 2018. However, studies are needed to determine the conservation status of the species and morphometric and systematic studies are necessary to solve the identification problem amongst species of *Artibeus*.

The keys for Honduras must be updated using the latest taxonomic arrangements and new records for the country. Furthermore, there are more than 9000 vouchers in different museums all over the world whose identification needs to be verified. More sampling is needed in certain areas of the country, especially in western Honduras (e.g. La Paz, Intibucá) or the most eastern region of the department of Gracias a Dios that borders Nicaragua. A reassessment of the conservation status for many species must be done considering these changes and this is especially true for many species that have not been recorded recently (e.g. *M. macrophyllum* has not been known since 1969). This updated checklist documents the high biodiversity of Honduran bats and is also an example of how poorly many groups have been studied since first

being recorded in the country. We hope to encourage the existing and future generations of researchers to not only report new records and update checklists, but to engage in ecological bat research urgently needed in Honduras.

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Appendix 1

The following list includes all the specimens examined in this study with their respective localities as were written in the labels:

Artibeus inopinatus (2)
Honduras: *Comayagua*: La Carbonera (CZB–2019–10); *Francisco Morazán*: Carboneras (UVS–V–02063)

Chiroderma gorgasi (1)
Honduras: *Gracias a Dios*: Ciudad Blanca (UVS–V–02529)

Cynomops greenhalli (1)
Honduras: *Comayagua*: 580 m (TCWC 22123)

Cynomops mexicanus (1)
Honduras: *Atlántida*: La Ceiba, S.A.G. Laboratorio (TTU 104070)

Eptesicus furinalis (as *Eptesicus andinus*) (1)
Honduras: *Atlántida*: La Ceiba, S.A.G. Laboratorio (TTU 104074)

Hylonycteris underwoodi (1)
Honduras: *Gracias a Dios*: Ciudad Blanca (UVS–V–02527).

Leptonycteris yerbabuenae (2)
Honduras: *Valle*: 1.7 MI S, 8 MI W Nacaome (TCWC 49748, TCWC 49749)

Lonchorhina aurita (2)
Honduras: *Francisco Morazán*: Carboneras (UVS–V–02067, UVS–V–02075)

Mimon cozumelae (1)
Honduras: *Colón*: Wuarska (UVS–V–02059)

Myotis pilosatibialis (1)
Honduras: *Francisco Morazán*: 1 km W Talanga (LACM 36879)

Natalus lanatus (as *Natalus mexicanus*) (2)
Honduras: *Francisco Morazán*: 6 mi N Zamorano (TCWC 10992; *La Paz*: at 2 mi W Cueva del Viejo (TCWC 11008)

Natalus mexicanus (1)
Honduras: *Copán*: 6 km ESE Copan, 900 m (TCWC 19698)

Sturnira hondurensis (as *Sturnira bogotensis*) (2)
Honduras: *Intibucá*: La Esperanza (PSM 13753, PSM 13754)

Thyroptera tricolor (3)
Honduras: *Gracias a Dios*: Ciudad Blanca (UVS–V–02525, UVS–V–02532, UVS–V–02533)