

A name for Striolated Puffbird west of the Rio Madeira with revision of the *Nystalus striolatus* (Aves: Bucconidae) complex

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The Striolated Puffbird, *Nystalus*⁴ *striolatus* (Pelzeln, 1856), has an Amazonian-wide distribution and reaches at least 1850 m in the Bolivian Andes (Rasmussen and Collar 2002, Tobias and Seddon 2007). The species is commonly illustrated as having two widely disjunct populations, one from Mato Grosso, Brazil westward to the foothills of the Andes, and another in eastern Pará, Brazil. It has been assumed (e.g. Rasmussen and Collar 2002) that populations in the western, roughly one-half of the range were of the nominate subspecies with the eastern limit of the distribution, south of the Marañón/Solimões, vaguely designated as the state of Mato Grosso (Peters 1948). The type series of the nominate subspecies comprises eight specimens collected by Johann Natterer in July-August 1826 at “Engenho do Capitão Gama” and “No Dourado” in southwest Mato Grosso, Brazil (Pelzeln 1856, Schifter *et al.* 2007). Both localities are close to the city of Pontes e Lacerda (Vanzolini 1993), and east of the rios Madeira/Guaporé. Nearly a century later, Bond and Schauensee (1940) described a new form, *Nystalus striolatus torridus*, type locality Rio Guamá near the city of Belém, Pará. According to these authors, *N. s. torridus* is distinguished from the nominate form by its overall darker coloration, larger size, color of the throat, more heavily streaked breast and underparts, and spotted interscapular region.

In July, 2008, BMW tape-recorded the song of *Nystalus striolatus* west of Jacareacanga, Pará, in the Madeira-Tapajós interfluvium, noting that it was quite different from that of birds west of the Madeira, and also different from but more similar to the song of eastern *N. s. torridus* he knew well from localities in Pará and the Rio Cristalino in northeastern Mato Grosso. On that occasion and in December, 2011, on the right bank of the middle Rio Madeira, he and FS recorded and collected two individuals. At the time, they thought it likely that this vocally distinctive population occupying the Madeira-Tapajós interfluvium represented an unnamed, species-level form but early in 2012, VQP pointed out that the type locality of *N. s. striolatus* is on the right bank of the Rio Madeira which led to our collective awareness that it was in fact the widespread, western Amazonian song-type that lacked a name. After gathering specimens of all song-types, examining a larger sample of recordings, and performing a DNA-based phylogenetic analysis, we propose that the Striolated Puffbirds west of the Rio Madeira, including those north of the Rio Marañón, be henceforth known as:

Nystalus obamai

Western Striolated-Puffbird

Rapazinho-estriado-do-oeste (Portuguese)



Holotype.— MZUSP 94819, adult male (skull 100% ossified, testes 4 × 2 mm), from the left bank of the Rio Madeira in the municipality of Porto Velho in the state of Rondônia, Brazil, “Caiçara” study plot, transect 3 (9°26'54”S, 64°50'00”W), collected by Fabio Schunck (field numbers J1981; FSK007), prepared by V. Q. Piacentini on 31 October 2012; voice recorded (original numbers FS-15, 16, and 17), Macaulay Library of Natural Sounds (ML) 169982, tissue samples (muscle and liver) preserved in alcohol 99%; carcass saved. Hologenotype (Chakrabarty 2010) sequences of the mitochondrial gene cytochrome *b* (1025 bp) deposited in GenBank (accession number KC874913).

Diagnosis: Morphology.— The only diagnostic plumage character of *Nystalus obamai* we were able to identify among specimens examined is the presence in the mantle of numerous wholly blackish feathers with no pale terminal fringes. *Nystalus s. torridus* is darker overall and the mantle is slightly browner, less blackish, such that it contrasts less with the remainder of the upperparts, and mantle feathers apparently always have pale terminal fringes. We have been able to examine closely only two specimens of *N. s. striolatus*. One from the right bank of the Rio Madeira approaches *N. obamai* in possessing a few wholly black feathers in the mantle; the other, from the left bank of the Rio

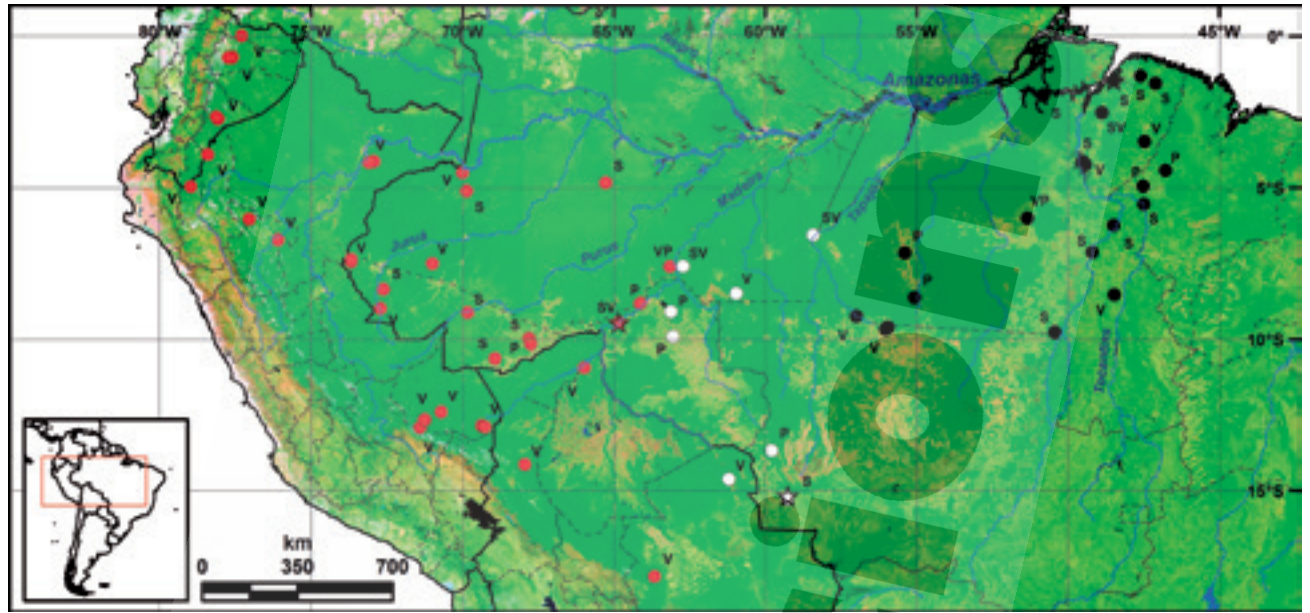
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⁴ Genus *Nystalus* 7: 127.

Figure 1.
Geographic distribution of the three species in the *Nystalus striolatus* complex. Red dots = *N. obamai*; White = *N. striolatus*; Black = *N. torridus*. Stars mark respective type localities. Letters adjacent to locality dots provide documentation: S = specimen; V = vocal recording; P = digital photographs. The identity of taxa in photograph-only records is based on expected biogeographic patterns. Black lines mark international boundaries.



Tapajós, more closely resembles *N. s. torridus*, having a slightly less contrasty mantle with pale tipping on nearly all feathers. Among the three taxa, *N. obamai* tends to have the weakest crown spotting with most of it concentrated in the anterior half. **Voice.**— Differs diagnostically from both *N. s. striolatus* and *N. s. torridus* in having the first, long note of the shared, two-note song motif distinctly stuttered into three, sometimes four, syllables. The other taxa have monosyllabic or weakly bisyllabic first-note structures. **Genetic divergence.**— *Nystalus obamai* is roughly 3% divergent in mitochondrial DNA (cytochrome *b*) from both *N. s. striolatus* of the Madeira-Tapajós interfluvium, and *N. s. torridus* of lower Amazonia, east of the Rio Tapajós (see *Phylogenetic relationships*, below).

Distribution.— Based on the distribution of the diagnostic and highly distinctive song-type of *Nystalus obamai* established, in part, through analysis of specimens that were voice-recorded prior to collection, the species occupies the Amazon basin west of the Rio Madeira, both north and south of the Rio Solimões/Marañón, and rises into the Andean foothills to at least 1700 m in southern Ecuador and 1850 m in northern Bolivia (Fig. 1). Occurrence is unpredictably patchy in tall forest and well-developed second-growth (see *Ecology and behavior*, below).

Description of holotype.— See color illustration and Figure 2. Several photos of the holotype and paratype in Figure 2 were made at the time of collection by FS and are archived at the MZUSP. Alphanumeric color designations determined through direct comparison with Munsell soil color charts (1994); colors in quotation marks are chart designations. Plumage fresh and unworn; no molt. Stiff, black, hair-like bristles surround base of bill, longest between eye and commissure and densest over nares. Lores whitish. Crown brownish black (10YR 2/1), each feather of the anterior half conspicuously margined rufous (“strong brown” 7.5YR 5/8), those from mid-crown posterior to occiput mostly plain but some, especially along the sides, bear similar rufous fringes. Conspicuous, 10-mm wide pale ochraceous (mix of 10YR 7/8 and 8/8) nuchal collar (feathers with minute, black terminal fringes) contrasts sharply with darker crown and back. Mantle same brownish black as crown, most feathers without pale markings; scapulars and posteriormost feathers of mantle bear “yellowish brown” (10 YR 5/8) terminal fringes paler than fringes on coronal feathers. Lower back and rump just slightly browner than mantle, each feather marked with a “yellowish-brown” median block on either side of the dark line along the rachis, and a “yellowish-brown” tip. Chin feathers stiff, curved, and “bristly” or hair-like, plain cream-white. Upper throat this same white moderately contrasting with the surrounding brownish (slightly paler than 10YR 7/8) lower throat through lower breast. Every feather of underparts anterior to belly marked with a fine, black central stripe completely encompassing rachis, the thickest and most obvious stripes marking the largest feathers except for malar region where most feathers bear disproportionately wide stripes. Belly same cream-white as throat, flanks broadly striped and weakly tinged “very pale brown”

Figure 2.
Dorsal (A), lateral (B), and ventral (C) aspects of a paratype (left; MZUSP 94818) and the holotype (right; MZUSP 94819) of *Nystalus obamai* to show marked individual variation and the effects of feather wear and oxidation on the appearance of these birds. Note also the uniformly dark mantle of *N. obamai*. These two males were recorded and collected from adjacent trees two days apart.



(10YR 8/4); undertail coverts this same color and unmarked. Rectrices slightly paler (nearest "dark grayish brown" 10YR 4/2) and spot-banded with the same "yellowish brown", these markings completely crossing the feather only through the distal half; feather tips slightly paler. Wing coverts same "dark grayish brown" with conspicuous (about 1.2 mm wide) "yellowish brown" margins; primary coverts "dark grayish brown" with minute "yellowish brown" tips. Dorsal surface of primaries slightly darker than rectrices and edged with a bit of "yellowish brown" on the center portions of the distal webs, ventral surface of each feather marked with "very pale brown" (10YR 8/4) stripe bordering the posterior portion of the proximal web, the posterior extension of this pale marking increasing gradually from outer to inner primaries. Dorsal surface of secondaries more heavily marked with this color which extends posteriorly to narrowly tip the distal webs, ventral surface as described for primaries only bearing increasingly greater extent of the color such that both feather webs are included on the innermost secondaries. Underwing coverts plain "very pale brown" (10YR 8/4). **Soft parts in life:** bill yellowish-green with darker tip and ridge of culmen; tarsus and feet yellowish-green; iris yellowish-white. **Standard measurements:** total length (just before specimen preparation) 198 mm; bill (culmen from base at skull) 31.5 mm; bill from anterior edge of nares 19.0 mm; bill width at anterior edge of nares 9.7 mm; wing (chord) 78.6 mm; tail 65.0 mm; tarsus 20.5 mm; mass 43 g.

Etymology.— Barack Hussein Obama II has proven to be a public servant of the highest caliber. He was elected and re-elected the 44th President of the United States based primarily on his outstanding professional record as a fair-minded, resolute, and visionary humanitarian. With the name of this puffbird, we are pleased to recognize Obama's remarkably positive and pervasive influence on the world stage and, in particular, we support his staunch initiative to bring development of solar energy to the forefront at a time when this obviously ideal global energy solution is, incredibly, still an uphill battle. The mainstream use of solar power around the world will benefit all, certainly including the flora, fauna, and people of Amazonia, mainly by allowing the Earth's natural atmosphere to persist. We are optimistic that the fast-developing capacity of relatively inexpensive solar energy to power almost everything will, over the course of the coming 30-50 years, result in the move away from petroleum-based and carbon-burning energy sources on a global scale; the virtual extinction of the internal combustion engine (car shows only, folks); and the destruction of most of the ecologically devastating hydroelectric dams and wind-farms that we are currently installing in all corners. The critical start of this cleaner and ultimately more economical future is, and always has been, the hard part.

The English and Portuguese names reference the upper Amazonian distribution of the new species within the striolated-puffbird complex.

REMARKS

Type series.— Paratypes of *Nystalus obamai* are the following thirteen specimens: MZUSP 94816 female, 94817 male, 94818 male, 94820 sex undetermined, 94821 female (all from within 1 km of the type locality); 35673 male, 35674 male, and 35675 female (AC, rio Iquiri); Museu Paraense Emilio Goeldi (MPEG) 64437 sex undetermined (AC, Capixaba, BR-317 km 164), 63279 female (AC, Santa Rosa, left bank rio Purus, mouth of rio Chandless); 62026 male, 62027 male, and 62028 female (AC, Porto Walter). There is no sexual dimorphism and no apparent dichromatism, and we were impressed with the level of individual variation in plumage features (such as distribution of rufous edging on crown feathers; thickness of streaking in the underparts; and width of dark/rufous barring in the tail) across all three taxa in the complex being so extensive as to render our attempts to identify distinguishing characters irreproducible. We noted that carpal markings were at least weakly present on all specimens except the holotype, which has entirely plain, buff ("very pale brown" 10YR 8/4) underwing coverts. Iris color of all taxa is clear yellowish/whitish, with perhaps a tendency for *N. s. torridus* to have darker, slightly more brownish eyes. The degree of possible age-related variation in colors of soft parts needs further study.

Two specimens from the far southeastern edge of the distribution on the upper Rio Araguaia (MPEG 48563, male from

municipality Santana do Araguaia; and 52359, male from municipality São Geraldo do Araguaia) stood out from the series of *torridus* and birds west of the Madeira (= *obamai*) at the MPEG by their overall paler plumage showing much weaker regions of contrast. Unfortunately, we have no recordings or modern tissues from that region, but we will now focus attention on finding these birds in the field and obtaining more data on them.

Nystalus s. torridus tends to be larger than both nominate *N. striolatus* and *N. obamai* (Fig. 3), confirming at least part of the diagnosis of Bond and Schauensee (1940) who, however, had a much smaller series of specimens for comparison. The size difference is especially notable in the proportions of the bill when compared visually to specimens of the new species. Our small sample of nominate *N. striolatus* precluded robust analyses, but it is possible that it will prove to have a tail/wing ratio distinct from those of *N. obamai* and *N. s. torridus*.

Ecology and behavior.— Humid, *terra firme* river- and road-edge forest and old second-growth at least 18 meters tall with broken canopy provide suitable habitat structures for *Nystalus obamai*; it does not inhabit seasonally flooded or seasonally dry forests and is absent from dense, closed forest canopies. Where structurally appropriate *terra firme* forests grow on relatively nutrient-rich soils, such as low Andean foothills, the likelihood of its presence may be increased (Pomara 2009, BMW *pers. obs.*). *Nystalus obamai* is absent from *campinas/varillales*, is scarce in *campinarana*, and appears to be largely absent from tall, sandy-soil forests even if these are structurally very similar to occupied forests, suggesting that phytogeographic composition could be important in determining habitat suitability. *Nystalus obamai* does not seem to be especially ecologically similar to any other puffbird or other birds across its range. We find its presence/absence at most well-forested localities far from known sites of occurrence unusually (relative to most other Amazonian birds) difficult to predict.

Rasmussen and Collar (2002) summarized basic information on ecology and behavior from the scant literature on the life history of the Striolated Puffbird. We can augment that with our observations that *Nystalus obamai* sits inside treecrowns, rarely on exposed perches, usually less than 1 meter from the periphery. Several individuals have been observed foraging from perches on electric wires along the main road bisecting the Urucu oil field southwest of Coari, Amazonas, mainly near creek-side forest (Whittaker *et al.* 2008). Members of pairs usually forage in close proximity, often only a few meters apart, but may be nearly 100 m apart. Individuals may sit patiently for over an hour before executing a rapid, forceful 3-8 m lateral sally-strike to foliage, usually at the periphery of a canopy treecrown, which may be accompanied by a loud single or rapid-fire bill clapping as the bird takes orthopterans, caterpillars, and other arthropod prey items which may exceed 8 cm in length. Large prey items are grasped with the bill across the thorax and thrashed into submission against the bird's perch before being swallowed whole – which process may take several minutes – after which the bill is often opened and closed a couple of times, then wiped clean on both sides. Stomach contents of three individuals (MZUSP 94818, 94819, 94821) comprised entirely in-

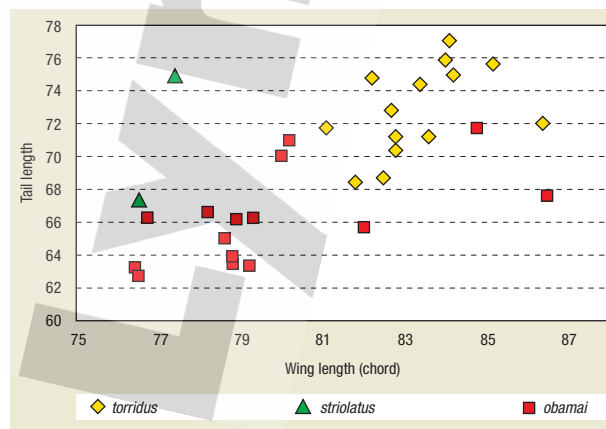
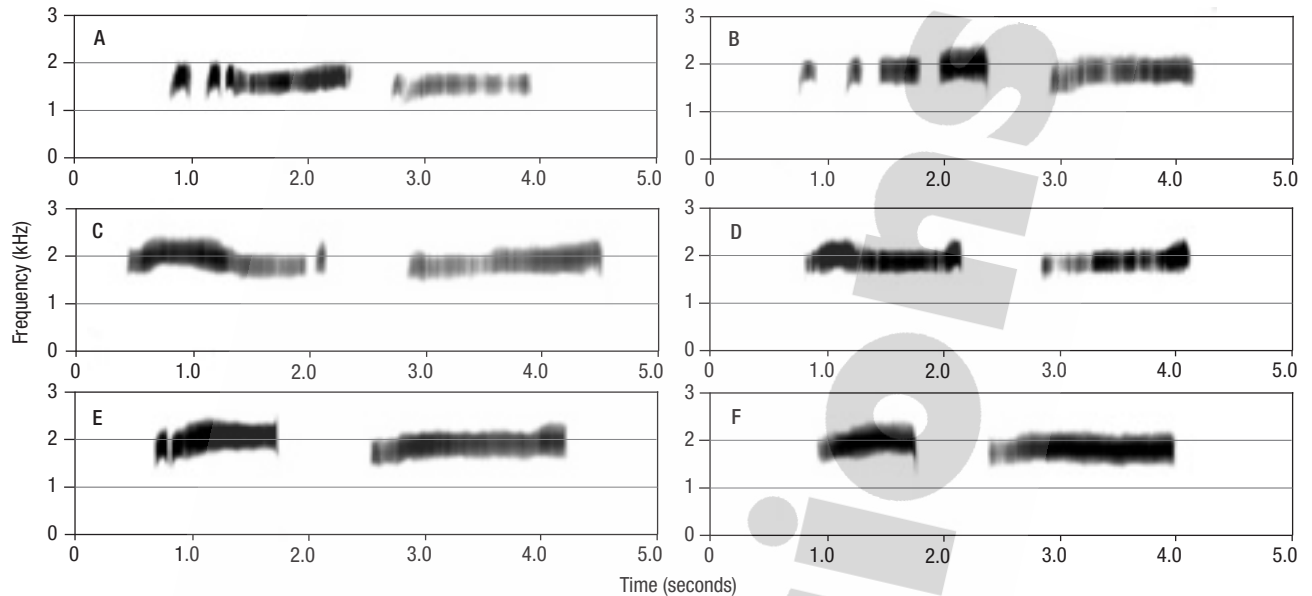


Figure 3. Distribution of tail and wing measurements for specimens of the three species in the *Nystalus striolatus* complex (sexes combined). *Nystalus torridus* tends to be larger than the other species, slightly overlapping *N. obamai*.

Figure 4. Spectrograms of typical vocalizations of the three species in the *Nystalus striolatus* complex. Two geographically remote examples of each are presented. *Nystalus obamai*: A) RO; left bank Rio Madeira, paratype, 29 October 2012, FS-11 and B) Ecuador; Napo, Loreto road, 20 December 2001, Nick Athanas, Xeno-Canto 8045. *Nystalus striolatus*: C) AM; right bank rio Madeira ca. 39 km east of the Madeira, 13 December 2011, BMW-14989 and D) PA; ca. 90 km west of Jacareacanga, 5 km west of the Rio Tapajós, 19 July 2008, BMW-4767. *Nystalus torridus*: E) PA; Floresta Nacional de Carajás (Marantz and Zimmer 2006) and F) PA; Tailândia, 21 January 2004, LFS USP-1253. These recordings are available for listening to on the Internet Bird Collection (IBC) website.



sect fragments, mostly Orthoptera, with at least one chrysomelid (subfamily Galerucinae) beetle. These samples are preserved at MZUSP.

It is not unusual to hear more than one pair of *Nystalus obamai* singing in close proximity, presumably on neighboring territories. The holotype and one paratype (MZUSP 94818) – both males with reduced testes – were collected in adjacent trees two days apart. Their plumages are in dramatically different stages of abrasion and oxidation from exposure to sunlight (Fig. 2); the individual showing greater feather wear was apparently immediately replaced on that territory by the bird in fresh plumage, which was selected for the holotype.

Vocalizations.— Like all members of the *Nystalus striolatus* complex, *N. obamai* sings often, mostly on sunny mornings shortly after sunrise and again around sunset, and it can be stimulated to respond vocally with even a crude whistled imitation of the song. As different as the songs of *N. obamai* and *N. s. torridus* are, both can usually be stimulated to sing back when presented with imitations or recordings of the other taxon although they do not approach as they usually do to playback of conspecific songs (BMW, pers. obs.). VQP noted that *N. obamai* at the type locality responded to playback of its own song more aggressively by approaching and singing back louder, than when presented with playback of a recording of *N. s. torridus*. Pairs frequently vocalize in tandem, with the presumed male singing first, this song slightly higher in frequency (or “pitch”) than the otherwise identical (presumed) female song which typically follows about one second later. Songs of members of the complex share a two-part motif with most of the differentiation affecting the first part (Fig. 4). The song of *N. obamai* is notably different from those of the other two taxa in having the first, longer part distinctly stuttered into three or four syllables, the first two or three of which are quite brief. There is slight variation in the song across the extensive range of *N. obamai*, but samples are insufficient to determine whether there is a geographic basis for it. Of the other two taxa, the song of *N. s. torridus* is most similar in that it often features a slight break in the first part almost producing a bisyllabic effect. The first part of the song of *N. s. striolatus* is characterized, in our sample of four individuals, by a continuous, falling then rising first part. One individual a short distance east of the lower Rio Madeira several times added a third part to its song, a lower note that followed the first two at the same interval, which BMW at first thought might have been delivered by the bird’s mate.

Phylogenetic relationships and taxonomy.— DNA sequence data for the mitochondrial gene cytochrome *b* (*cyt b*, 1025 bases pairs) were obtained for 4 individuals of the *N. striolatus* complex (Fig. 1), including *N. s. striolatus* (N = 1), *N. s. torridus* (N = 1), and *N. obamai* (N = 2). Trees (not shown) were rooted in

Malacoptila semicineta (Bucconidae). The phylogeny estimated by Bayesian inference strongly supports the monophyly of the *N. striolatus* complex (posterior probability = 100%), as well as the monophyly of *N. obamai* (posterior probability = 100%). However, the basal relationships among the equally genetically divergent *N. s. striolatus*, *N. s. torridus*, and *N. obamai* are poorly supported, with a purported sister relationship between *N. s. torridus* and *N. obamai* receiving non-significant statistical support (posterior probability = 57%), thus rendering internal relationships in the *N. striolatus* complex a basal trichotomy. The fact that the Bayesian phylogeny recovered *N. obamai* as monophyletic with high statistical support, and that it is separated from both *N. s. striolatus* and *N. s. torridus* by similar uncorrected genetic p-distances (respectively, 3 and 3.5%), in conjunction with morphological and vocal diagnoses, convinces us that it is most appropriately recognized as a species-level taxon. The same can be inferred for *N. s. striolatus* and *N. s. torridus*, which are supported by the aforementioned vocal and morphological diagnoses and separated by 3.2% of uncorrected sequence divergence. Thus, we recommend the recognition of three species in the *N. striolatus* complex: Western Striolated-Puffbird (*N. obamai*; distributed west of the Madeira river in Brazil and both banks of the Ucayali/Marañon in Peru and Ecuador, as well as along the foothills of the Central Andes in Bolivia and Peru; Fig. 1); Natterer’s Striolated-Puffbird (*N. striolatus*; distributed in the Madeira-Tapajós interfluvium in central Amazonian Brazil and crossing the Rio Guaporé into northeastern Departamento Santa Cruz in Bolivia); and Eastern Striolated-Puffbird (*N. torridus*; occurring east of the Tapajós and south of the Amazon rivers to western Maranhão and northern Tocantins in Amazonian Brazil).

Conservation.— *Nystalus obamai* is widespread, but assurity of its presence in many areas of the western Amazon basin, especially sites far from Andean foothills, would (in our opinion) require ground-truthing. The species is not currently threatened.

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