The composite identity of Muscicapa virens Linnaeus, and a neotype designation for Eastern Wood Pewee Contopus virens (Tyrannidae)

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Source: Bulletin of the British Ornithologists' Club, 143(2) : 196-211

Published By: British Ornithologists' Club

URL: https://doi.org/10.25226/bboc.v143i2.2023.a5

The composite identity of *Muscicapa virens* Linnaeus, and a neotype designation for Eastern Wood Pewee *Contopus virens* (Tyrannidae)

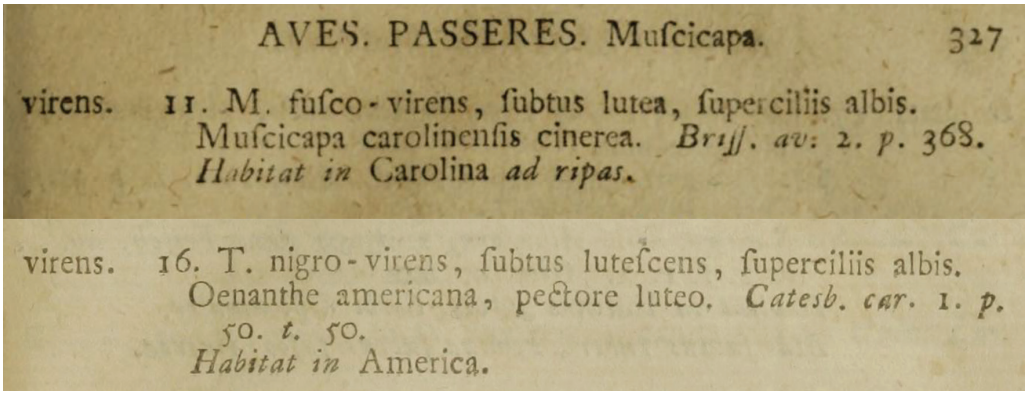
by Matthew R. Halley

Received 4 October 2022; revised 28 March 2023; published 7 June 2023

http://zoobank.org/urn:lsid:zoobank.org:pub:517C7471-E515-4A7A-9AD0-5EA72543793B

Summary.—I reviewed the material basis of *Muscicapa virens* Linnaeus, 1766, long presumed to be the original description of Eastern Wood Pewee *Contopus virens* (Linnaeus), type species of the genus *Contopus* Cabanis, 1855, and found it to be an unidentifiable taxonomic composite. Linnaeus' (1766) account was partly based on Brisson's (1760) 'Gobe-mouche Cendré de la Caroline', which was based on (1) a non-extant specimen that, as demonstrated herein, was probably a species in the genus *Empidonax* Cabanis, 1855, and (2) Catesby's (1731) 'little brown Fly-catcher', which was also a taxonomic composite. Linnaeus (1766) also included a novel character in his original description of *M. virens*—a white supercilium ('*superciliis albis*')—which is lacking in Eastern Wood Pewee, and was probably miscopied from Catesby's (1731) description of 'Red-eyed Fly-catcher' (= Red-eyed Vireo *Vireo olivaceus* Linnaeus, 1766), which appeared on the same plate as the 'little brown Fly-catcher'. In light of these ambiguities, after a thorough review of literature and relevant primary sources, I designate a neotype specimen for *C. virens* (Linnaeus) that stabilises nomenclature in accordance with prevailing use.

For more than two centuries, scholars have consistently cited *Muscicapa virens* Linnaeus, 1766 (Tyrannidae) as the original description of Eastern Wood Pewee *Contopus virens* (Linnaeus), a common migratory species that breeds in eastern North America and winters in South America (e.g., Wilson 1810: 81, Nuttall 1831: 285, Baird *et al*. 1858: 190, AOU 1886: 234, 1931: 210, 1983: 449, 1998: 392, Watt *et al*. 2020, Chesser *et al*. 2022, Pyle 2022). However, in his original description, Linnaeus (1766: 327) included a conspicuous character not present in *C. virens*—a white supercilium, or line above the eye ('*superciliis albis*', Fig. 1,


AVES. PASSERES. Muſcicapa. 327

virens. 11. M. fuſco-virens, ſubtus lutea, ſuperciliis albis. Muſcicapa carolinenſis cinerea. *Briſſ. av.* 2. *p.* 368. *Habitat in* Carolina *ad ripas.*

virens. 16. T. nigro-virens, ſubtus luteſcens, ſuperciliis albis. Oenanthe americana, pectore luteo. *Catesb. car.* 1. *p.* 50. *t.* 50. *Habitat in* America.

Figure 1. (top) Original description of *Muscicapa virens* Linnaeus, 1766, courtesy of the Harvard University Botany Library. (bottom) Original description of *Turdus virens* Linnaeus, 1758, courtesy of the Peter H. Raven Library, Missouri Botanical Garden. Both images downloaded from Biodiversity Heritage Library (www.biodiversitylibrary.org, accessed 13 March 2023).

ISSN-2513-9894 (Online)

top). This rendered his description of *M. virens* nearly identical to *Turdus virens* Linnaeus, 1758 (Fig. 1, bottom), now known as Yellow-breasted Chat *Icteria virens* (Linnaeus, 1758), although these distantly related species are extremely unlikely to be confused in the field or museum.

To investigate this anomaly, I reviewed the material basis of *M. virens* by carefully scrutinising the original description and its nested set of cited works (i.e., Catesby 1731, Klein 1750, Brisson 1760). I compared measurements of specimens reported by those authors to an original dataset of comparable measurements, taken by me from study skins of eight morphologically similar flycatcher (Tyrannidae) species that occur in eastern North America, where the type material of *M. virens* was presumably collected. I also examined a high-resolution digital reproduction of Catesby's original painting of the 'little brown Flycatcher' and compared it to different editions of his published plates. Collectively, these lines of enquiry exposed the ambiguous (composite) identity of *M. virens* Linnaeus, 1766, which is the type species of the genus *Contopus* Cabanis, 1855.

Morphological data

I measured study skins (n = 519) of the following eight species in the bird collection of the Delaware Museum of Nature & Science, Wilmington (DMNH, formerly Delaware Museum of Natural History): (1) *Contopus virens* (Linnaeus, 1766); (2) Eastern Phoebe *Sayornis phoebe* (Latham, 1790); (3) Acadian Flycatcher *Empidonax virescens* (Vieillot, 1818); (4) Willow Flycatcher *E. traillii* (Audubon, 1828); (5) Olive-sided Flycatcher *Contopus cooperi* (Nuttall, 1831); (6) Least Flycatcher *Empidonax minimus* (Baird & Baird, 1843); (7) Yellow-bellied Flycatcher *E. flaviventris* (Baird & Baird, 1843); and (8) Alder Flycatcher *E. alnorum* Brewster, 1895.

For each specimen, I recorded (1) tail length, measured with a ruler to the nearest 1 mm, from the insertion point of the two central rectrices to the tip of the longest rectrix; (2) bill length, measured with digital callipers to the nearest 0.01 mm, from the bill tip to the posterior edge (corner) of the gape (i.e., Brisson's 1760 method); (3) wing length (flattened), measured with a ruler to the nearest 1 mm, from the carpal joint to the tip of the longest primary remex; and (4) tarsometatarsus length, measured with digital callipers to the nearest 0.01 mm, from the intertarsal joint to the distal end of the final leg scale.

I also compiled a large dataset of body mass measurements (n = 2,649) for the same eight species, by downloading records from VertNet.org (accessed 13 March 2023). Each mass datum was associated with a vouchered specimen in one of 29 different institutions (see Acknowledgements). I sorted the mass data by taxon and removed obvious outliers (i.e., likely data entry errors) from the tails of each distribution. I combined *Empidonax traillii* and *E. alnorum* into a single taxon ('*E. traillii sensu lato*') because study skins of these sibling species cannot be confidently identified without a description of voice (e.g., Stein 1963, Pyle 2022), which was missing from most study skin labels. I plotted the data and generated figures with the program R-Studio (R Core Team 2020).

The material basis of *C. virens* (Linnaeus)

There is no evidence that Linnaeus (1766) personally examined a specimen before writing his brief description of *M. virens*, and no specimen is known in the Linnaean collection in the Uppsala University Museum of Evolution (UUZM) at Uppsala, Sweden (Wallin 2001). Rather, he based his description (primarily, but apparently not exclusively; see below) on Brisson's (1760) 'Le Gobe-mouche Cendré de la Caroline … *Muscicapa Carolinensis cinerea*', which he cited (Fig. 1, top: '*Briss. Av*. 2. p. 368'). Brisson (1760) placed

ISSN-2513-9894 (Online)

stars next to the names of species of which he personally examined specimens (Allen 1910: 322), but his account of 'Le Gobe-mouche Cendré de la Caroline' was not so denoted (Brisson 1760: 368). This implies that Brisson's (1760) account was derivative, i.e., based on material examined by Catesby (1731) and / or Klein (1750), the only authors he cited. However, Brisson (1760) also reported measurements of a (presumably mounted) specimen that did not appear in those works, from which we may deduce that, despite the omission of stars, his account *was* actually based in part on original material (i.e., a syntype of *M. virens* Linnaeus, 1766). Notwithstanding, no specimen associated with Brisson's (1760) description is known, and a manual search of study skins and mounted specimens in the Muséum national d'Histoire naturelle, Paris (MNHN), in January 2023, failed to produce a specimen or any new information (P. Boussès *in litt*. 2023).

Without a specimen, we must rely on Brisson's (1760: 368) text description and measurements of 'Le Gobe-mouche Cendré de la Caroline' to establish its identity—just as Linnaeus (1766) did when writing his description of *M. virens* (but with the benefit of hindsight). Brisson's (1760) description of the colour of the bill ('Le demi-bec supérieur est noir, l'inférieur est jaune' = 'The [maxilla] is black, the [mandible] is yellow') eliminates *S. phoebe*, which has a black mandible. However, his description of the plumage is too vague to reliably distinguish among *C. virens* and multiple *Empidonax* species, which vary seasonally in colour (due to wear and fading) and exhibit a range of inter-individual colour variation within each species. Any of these species could plausibly be said to have ash-coloured dorsal plumage ('cendré foncé'), dirty yellowish-white ventral plumage ('d'un blanc sale & jaunâtre'), and wingbars ('les moyennes sont de la même couleur [brown] & bordées extérieurement de blanc'). Most of Brisson's (1760) reported measurements are also unreliable because they may be influenced (distorted) by the preparator. The distance between the bill tip and the end of the tail, and the length of the wings relative to the tail, may be adjusted to suit the preparator's stylistic preferences; and toe measurements cannot be replicated without knowing their degree of curvature.

Only two measurements reported by Brisson (1760) are more or less reliable (stable) and amenable to modern comparisons. His measurement of tail length, which was presumably recorded from the point of insertion to the tip of the longest rectrix ('sa queue deux pouces' = 54.1 mm, if 1 pouce = *c*.27.07 mm; Débarbat 1799), falls below the range of *C. virens* (n = 49, range = 55–66 mm) and within that of multiple *Empidonax* species (Fig. 2). Brisson's (1760) bill length measurement, recorded from the tip of the bill to the corner of the gape ('Son bec depuis son bout jusqu'àux coins de la bouche a huit lignes de long' = 18 mm, if 1 ligne = *c*.2.256 mm), also fails to identify his specimen as *C. virens* (Fig. 3). This suggests that Brisson's (1760) syntype of *M. virens* may have been one of the *Empidonax*—not Eastern Wood Pewee.

Next, we must examine Catesby (1731) and Klein (1750) to assess if they described any original specimens unambiguously identifiable as Eastern Wood Pewee (i.e., that might serve as a lectotype to rescue the name *C. virens*, since Brisson's syntype was probably an *Empidonax*). Of these, Klein (1750) lacked original material and merely cited Catesby (1731). Notably, Brisson (1760) stated that his syntype was a nearly identical match ('avec un figure assez exacte') to the upper bird figured on Pl. 54 of Catesby (1731), which he called the 'Petite preneur de mouches brun' (i.e., a French translation of 'little brown Fly-catcher'). Following tradition, many authors have identified Catesby's (1731) '*Muscicapa Fusca* / The little brown Fly-catcher' as an Eastern Wood Pewee (e.g., Reveal 2009: 300). However, there are several reasons to doubt this identification.

The species was not listed in specimen manifests sent by Catesby to Hans Sloane (1660–1753) in May 1723 and March 1724, which suggests that no specimen was preserved

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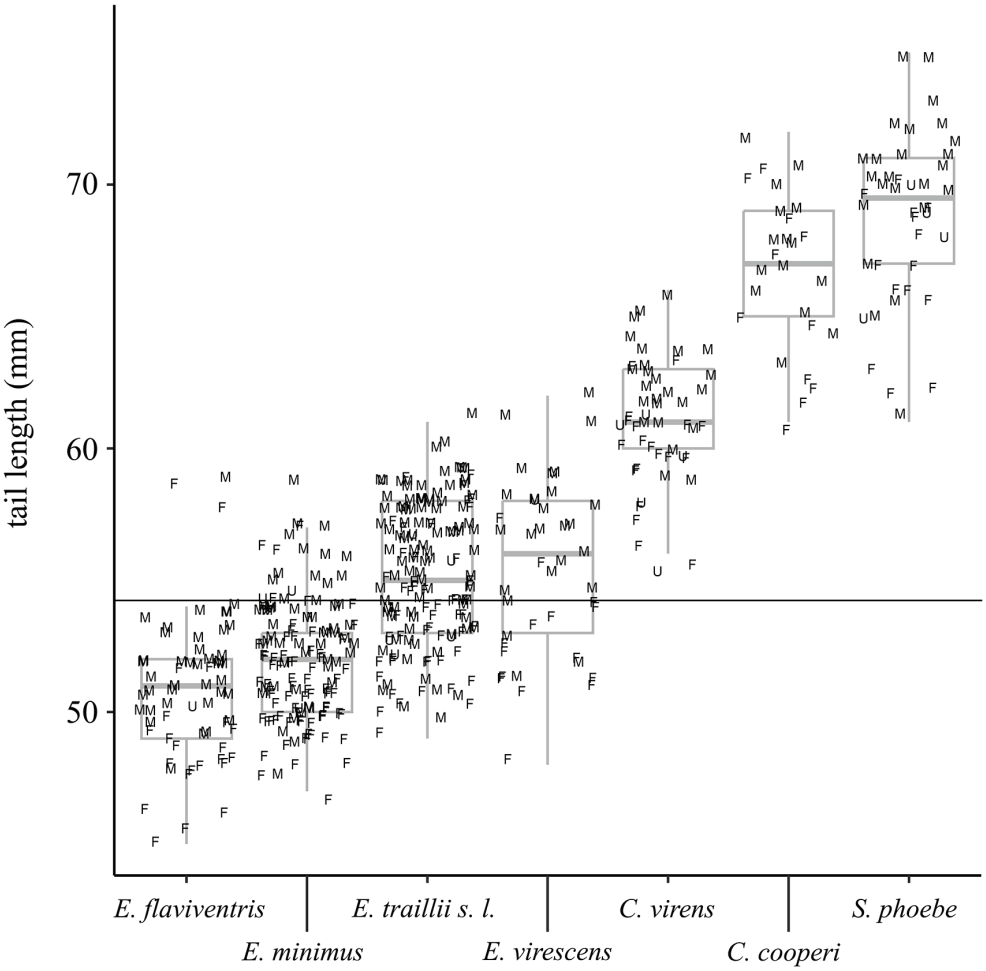

Figure 2. Tail length variation among eight tyrant flycatcher (Tyrannidae) species that occur regularly in eastern North America (*Empidonax* spp., *Contopus virens*, *C. cooperi*, *Sayornis phoebe*), from a sample of study skins in the DMNH collection (n = 507). Data from study skins of *Empidonax alnorum* and *E. traillii* were combined into a single category (*E. traillii s. l.*, see text). The sex class of each specimen is shown (F = female, M = male, U = unknown) and the horizontal line denotes the reported tail length ('deux pouces' = 54.1 mm) of 'Le Gobe-mouche Cendré de la Caroline' (Brisson 1760).

(Nelson 2017). Therefore, any identification must be made solely on the basis of Catesby's text description and plate, which contradict each other in morphological characters. The bird in Catesby's original watercolour (Fig. 4), which served as the model for his plate, lacks the ventral 'Tincture of yellow' mentioned in Catesby's (1731: 54) text, and also lacks the relatively prominent wingbars of Eastern Wood Pewee. In this respect, Catesby's 'little brown Fly-catcher' bears a closer resemblance to *S. phoebe*, which has paler (less prominent) wingbars than *C. virens*. Catesby's (1731: 54) reported body mass ('nine Penny-weight' = 14 g, if 1 dwt = 1.555174 g) fails to resolve this ambiguity (Fig. 5). Published (hand-coloured) prints of Catesby's plate vary widely in coloration between the first (1731) and third (1771) editions. The colourists of the third edition apparently attempted to reconcile the composite characters of Linnaeus (1766) and Catesby (1731) by giving the 'little brown Fly-catcher' a white supercilium (Fig. 6).

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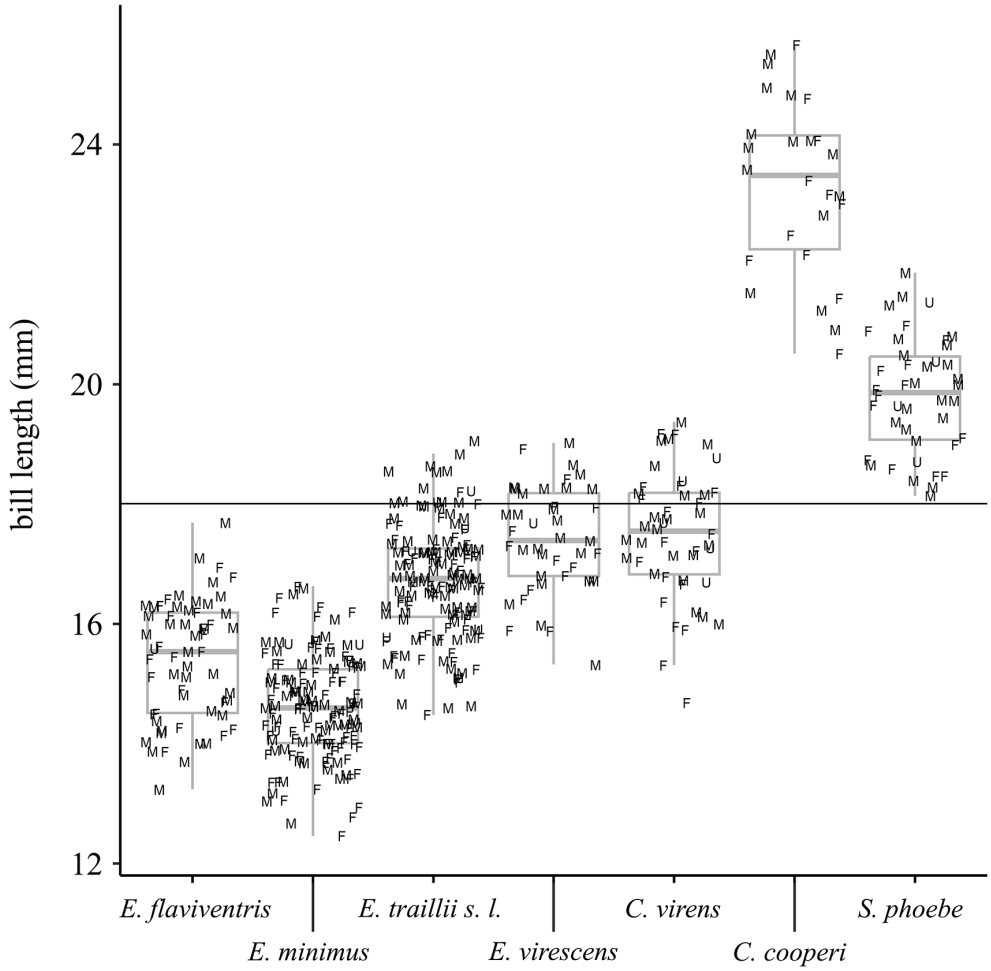

Figure 3. Bill length variation among eight tyrant flycatcher (Tyrannidae) species that occur regularly in eastern North America (*Empidonax* spp., *Contopus virens*, *C. cooperi*, *Sayornis phoebe*), from a sample of study skins in the DMNH collection (n = 499). Data from *Empidonax alnorum* and *E. traillii* were combined into a single category (*E. traillii s. l.*, see text). The sex class of each specimen is shown (F = female, M = male, U = unknown) and the horizontal line denotes the reported bill length ('huit lignes' = 18 mm) of 'Le Gobe-mouche Cendré de la Caroline' (Brisson 1760).

The white supercilium ('*superciliis albis*') was not mentioned by Brisson (1760), Klein (1750) or Catesby (1731). Apparently, it was an original addition by Linnaeus (1766). Although its inclusion rendered the description of *M. virens* superficially similar to the description of *Turdus virens* Linnaeus, 1758, which confused some early American ornithologists (see below), it seems more likely that Linnaeus (1766) miscopied it from Catesby's (1731) 'Red-eyed Fly-catcher' (= Red-eyed Vireo *Vireo olivaceus* Linnaeus, 1766), which appeared directly below the 'little brown Fly-catcher' on Pl. 54, and of which Catesby (1731: 54) wrote: 'From the Bill, over the Eyes, runs a dusky white Line' (Fig. 4). Either way, the composite *M. virens* included characters from species in at least two passerine families (i.e., Tyrannidae, and Vireonidae or Icteriidae). One of the syntypes was probably an *Empidonax* (Brisson 1760), and the other may have been a specimen of *Sayornis phoebe* (Catesby 1731). Furthermore, none of the original material can be unambiguously identified as the species now known as Eastern Wood Pewee.

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Figure 4. Original painting of (top) 'The Small brown flycatcher / *Muscicapa Fusca*' and (bottom) 'The green flycatcher / *Muscicapa virescens*' executed by Catesby *c*.1722–26, which served as the model for Catesby (1731, Pl. 54). The latter species (= Red-eyed Vireo *Vireo olivaceus*) appeared under the name 'Red-eyed Fly-catcher' in Catesby (1731) and has a prominent white supercilium (image used with permission of the Royal Collection Trust / © His Majesty King Charles III 2022).

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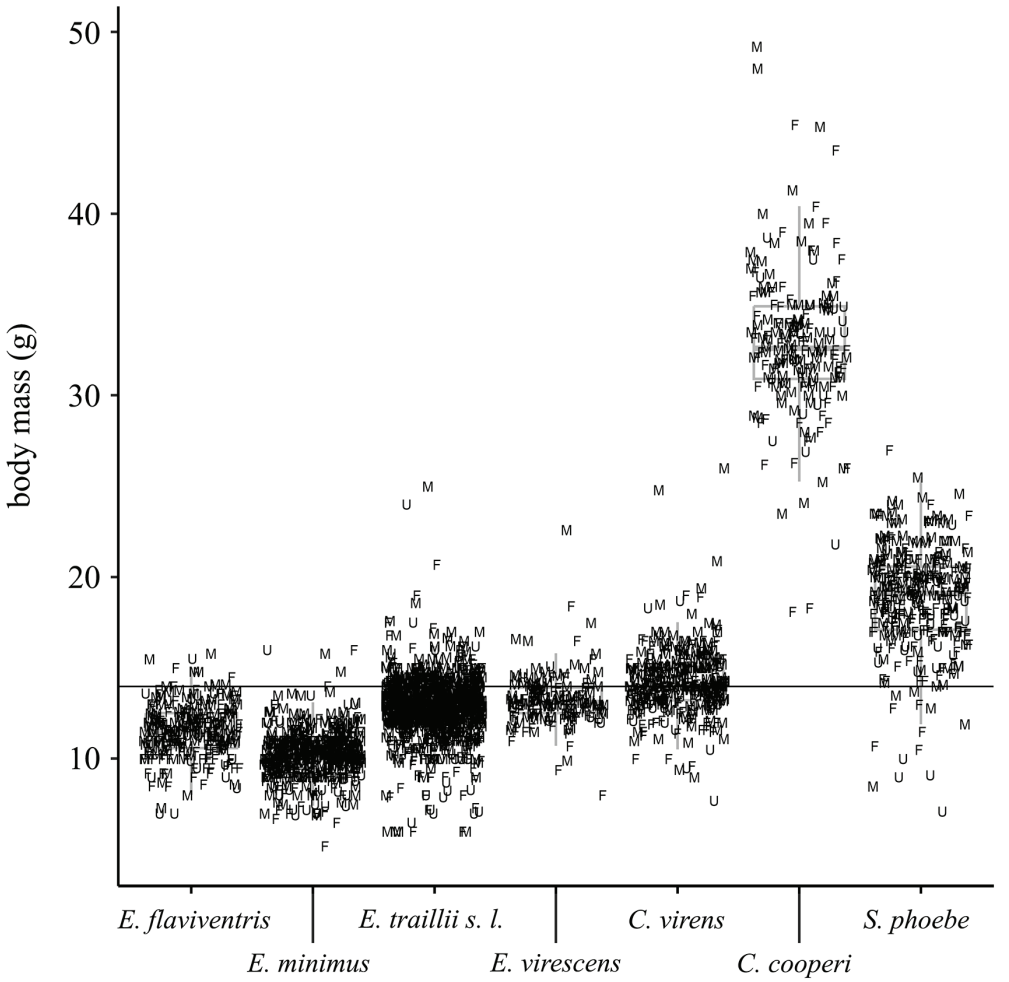

Figure 5. Body mass variation among eight tyrant flycatcher (Tyrannidae) species that occur regularly in eastern North America (*Empidonax* spp., *Contopus virens*, *C. cooperi*, *Sayornis phoebe*), from a large sample of specimens (n = 2,649) in multiple collections (see Acknowledgements), downloaded from www.VertNet.org (accessed 13 March 2023). Data from *Empidonax alnorum* and *E. traillii* were combined into a single category (*E. traillii s. l.*, see text). The sex class of each specimen is shown (F = female, M = male, U = unknown) and the horizontal line denotes the reported mass ('nine Penny-weight' = 14 g) of the 'little brown Fly-catcher' (Catesby 1731: 54).

Consequences of the composite *M. virens*

European authors of the late 18th century were confounded by the composite descriptions. In his account of the 'Cinereous [Flycatcher]', Latham (1783: 350) gave a brief and practically verbatim copy of Catesby's (1731: 54) description of 'little brown Fly-catcher'. Latham (1783) mentioned that he had examined a specimen in the British Museum ('Br. Mus.'), but virtually all of the specimens he described are believed to have perished by the early 19th century, 'probably [because] they were inadequately prepared, were always mounted, and, from a lack of appreciation of their priceless value, were allowed to decay, through a want of proper curatorial knowledge' (Sharpe 1906: 79). Pennant's (1785: 387) description of 'Cinereous [Flycatcher]', which was prepared prior to, and cited by, Latham (1783), included two composite characters: (1) 'eyes red', and (2) 'over each eye a

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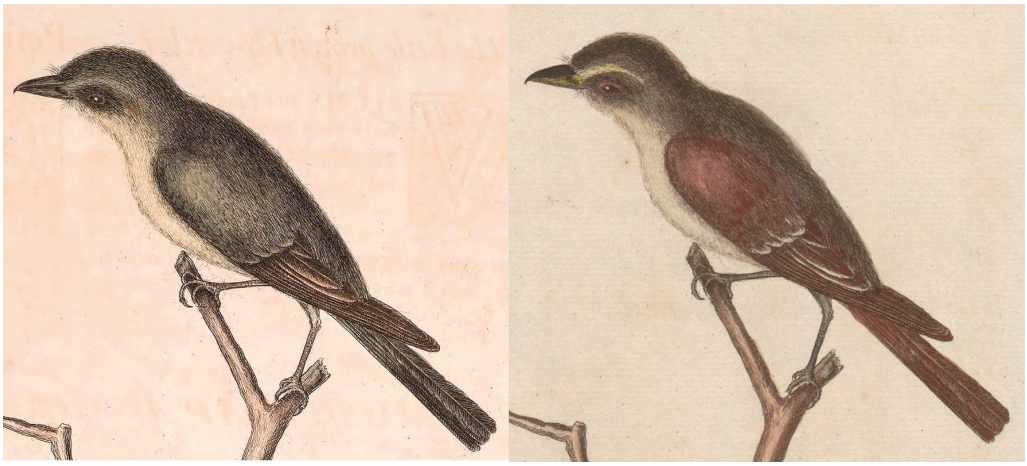

Figure 6. Colour variation in different editions of *The natural history of Carolina, Florida, and the Bahama Islands* (Catesby 1731, Pl. 54): (left) first edition, published in 1731; (right) third edition, published in 1771 by Benjamin White. Colourists for the third edition evidently attempted to reconcile the discrepancies between Pl. 54 and Catesby's (1731) text. Both images appear courtesy of Smithsonian Institution Libraries and Biodiversity Heritage Library (www.biodiversitylibrary.org, accessed 13 March 2023).

faint white line'. This suggests that Pennant (1785) may have consulted the third edition of Catesby (1731), published in 1771, which featured significant alterations to the colours of Pl. 54 (Fig. 6); or he may have directly miscopied characters from Catesby's (1731) 'Red-eyed Fly-catcher', like Linnaeus (1766) probably did. Gmelin (1789: 936), in his own description of *M. virens*, did not cite Linnaeus (1766) but nevertheless copied his original Latin description verbatim (including '*superciliis albis*'). Gmelin (1789) also cited Brisson (1760), whose description was likely based on an *Empidonax* specimen (see above).

Were ornithologists in America also confused by these composite taxonomic descriptions? Benjamin Smith Barton (1766–1815), Professor of Natural History at the University of Pennsylvania, taught the first university-based course in ornithology in North America in 1802. He brought his students to the 'Philadelphia Museum' of Charles Willson Peale (1741–1827), where hundreds of mounted birds were displayed in glass cases, and conveniently arranged according to the Linnaean system (Miller 1988: 473, Halley in press). Was there a specimen of Eastern Wood Pewee in the Philadelphia Museum by that time? Did Peale and / or Barton distinguish *C. virens* from the morphologically similar *Empidonax* species?

The earliest source that may refer to Eastern Wood Pewee is an entry in Peale's diary, dated 8 June 1788, written during a collecting trip to Annapolis, Maryland: 'before Dinner I preserved [a specimen of] … ~~unknown~~ nondescript (but commonly called Peewe)' (Miller 1983: 498). This bird remains unidentified because the name 'Pewee' (and its alternate spellings) was then colloquially used for the species now called Eastern Phoebe, although Peale noted in an unpublished lecture (*c.*1799) that '[*Sayornis phoebe* had] always been known in [his] family as sausy bird' (i.e., not 'Pewee'). Peale's lecture contained no description of Eastern Wood Pewee, but it may have appeared on the (now missing) page immediately before his description of *S. phoebe*, which Peale listed under the name 'Black Cap Flycatcher … *Muscicapa fusca* Linn. [*sic*, = Gmelin]') (Halley in press).

Barton's (1799) published works and unpublished manuscripts provide no indication that he distinguished Eastern Wood Pewee from the sympatric *Empidonax* species, despite having access to Peale's collection. An unpublished note, probably written in the mid-1790s, reveals that Barton initially assumed that *Turdus virens* and *M. virens* were the same species

ISSN-2513-9894 (Online)

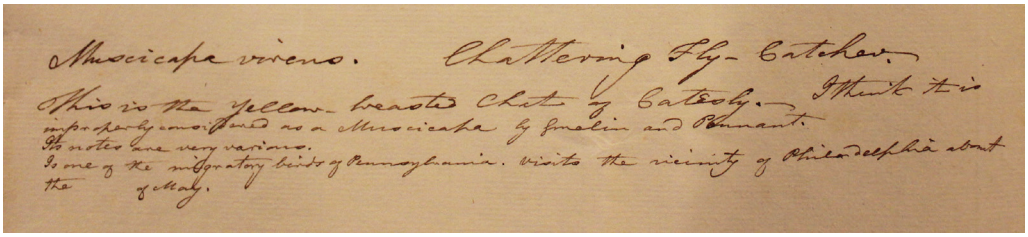

Figure 7. Unpublished note written by Benjamin Smith Barton (1766–1815), probably in the 1790s, before publication of Barton (1799): '*Muscicapa virens*. Chattering Fly-catcher. This is the yellow-breasted chat of Catesby. I think it is improperly considered a *Muscicapa* by Gmelin and Pennant. Its notes are very various. [It] is one of the migratory birds of Pennsylvania, visits the vicinity of Philadelphia about the [blank] of May.' Reproduced courtesy of the American Philosophical Society (APS) Library (coll. Mss.B.B284d), Philadelphia, PA (Matthew R. Halley)

(Fig. 7). Apparently, he was fooled by the superficial similarity of their descriptions and assumed that Linnaeus (1758 and 1766, respectively) had inadvertently described the same species twice, in two different genera. However, by the time Barton (1799: 19) published his famous calendar of bird migration, he seems to have corrected this error and was using the name '*M. viridis* [J. F. Gmelin, 1789]' for Yellow-breasted Chat (not *M. virens*).

Which species of flycatchers (Tyrannidae) did Barton (1799) distinguish in his calendar? First, he listed the arrival of '*Muscicapa fusca* (G.) [= J. F. Gmelin, 1789] … Black-headed Fly-Catcher. (Pewe.)' on 12 March 1791, which he (according to information in his Appendix) associated with the '*Muscicapa nunciola* of Bartram' (i.e., 'the pewit, or black cap flycatcher', Bartram 1791). This clearly refers to Eastern Phoebe, the earliest of the flycatchers to arrive on spring migration, which Peale also associated with the name '*Muscicapa fusca* Linn.' (see above, Halley in press). The name *M. phoebe* Latham, 1790 later gained priority for Eastern Phoebe after *M. fusca* J. F. Gmelin, 1789, which had been based on Catesby's (1731, Pl. 53) '*Muscicapa nigrescens* / The Blackcap Fly-catcher', was found to be preoccupied by *M. fusca* Statius Müller, 1776, which now refers to Scaly-breasted Thrasher *Allenia fusca*.

Next, Barton (1799) recorded the arrival of '*Muscicapa fusca* (Catesby) … Warbling Wren, or Green Wren' on 28 April 1791, which he considered synonymous with Bartram's (1791) '*Muscicapa cantatrix*, the little domestic flycatcher or green wren'. This seems unlikely to refer to any member of Tyrannidae (which do not 'warble') and is clearly not Eastern Wood Pewee, which is neither 'green' nor particularly 'domestic' (i.e., frequently found in towns and gardens). This may be a reference to Eastern Warbling Vireo *Vireo gilvus* Vieillot, 1808, which better fits Barton's (1799) morphological and behavioral descriptions. In any case, unlike later authors, Barton (1799) evidently did not associate Catesby's (1731) unidentifiable 'little brown Fly-catcher' with any species now classified in Tyrannidae.

Finally, Barton (1799) recorded the arrival of '*Muscicapa rapax* of Bartram … Olive coloured Fly-catcher, or Lesser Pewe' on 18 May 1791, of which he wrote: '[it is] the Lesser Crested Fly-Catcher of Mr. Pennant: the *Muscicapa acadica* of Gmelin. It is a very useful little bird, destroying numbers of the common house-fly and other troublesome insects. It continues with us until late in September, when it retires southerly to pass the winter' (Barton 1799: 19). Bartram's (1791) '*M. rapax*, the lesser pewit, or brown and greenish flycatcher', and the species in the cited accounts of Pennant and Gmelin, were vaguely described and unidentifiable, although likely referring to *C. virens* or one of the similar *Empidonax*. In summary, there is no evidence that Peale, Bartram (1791), Barton (1799) or any American author of the 18th century, distinguished the species now known as Eastern Wood Pewee from the morphologically similar *Empidonax* species.

ISSN-2513-9894 (Online)

Louis Pierre Vieillot (1748–1830), the French ornithologist, also visited the Philadelphia Museum during his travels in eastern North America from 1793–1798, and later described 'Le Moucherolle Plaintif, *Muscicapa querula*' Vieillot, 1808, which was probably either *C. virens* or one of the similar *Empidonax*. His description was based on a (presumably non-extant) specimen in his own collection ('De ma collection', Vieillot 1808: 68, Pl. 39), however, and not on a specimen in the Philadelphia Museum. The name *M. querula* Vieillot, 1808, has traditionally been cited as a junior synonym of *M. virens* (e.g., Watt *et al*. 2020). However, in hindsight, Vieillot's (1808) text description and plate were too vague to distinguish *C. virens* from the similar *Empidonax* species, and he provided no reliable measurements (see above) that would be helpful to resolve this issue. Although he did not list any synonyms of *M. querula*, Vieillot (1808: 68) stated that, except for being yellower on the ventral surface ('les parties inférieures du corps qui sont d'un blanc jaunâtre'), his specimen was practically identical to Catesby's (1731) 'little brown Fly-catcher'. He even suspected that they were the same species and the difference was due to Catesby's colourists taking creative liberties ('il est vraisemblable que cette difference provient du coloriste de la figure publiée par cet auteur', Vieillot 1808: 68). Therefore, Vieillot's (1808) *M. querula* cannot be unambiguously identified as an Eastern Wood Pewee or confidently disentangled from the enigmatic 'little brown Fly-catcher' of Catesby (1731).

To my knowledge, the oldest convincing evidence that ornithologists were in possession of a specimen of Eastern Wood Pewee is found in an unpublished essay written by Peale in 1805–06, entitled 'A Walk Through the Philad[elphi]a Museum' (Historical Society of Pennsylvania [HSP], coll. 0481). By this time, Alexander Wilson (1766–1813) was busy creating the artwork and text accounts for his forthcoming work, *American ornithology* (1808–14), and he occasionally visited the Philadelphia Museum to make drawings of Peale's specimens, and to inform the elder ornithologist of his progress. Referring to a mounted specimen in the Philadelphia Museum collection, Peale wrote:

> 'Here is another species considerably like the *M. fusca* [J. F. Gmelin, 1789 = *Sayornis phoebe*], but a smaller bird, whose manners also very much resemble it. Mr. Wilson [who is fond] of Natural History & a very accurate observer, gave me this account. But this species [is] only found in [the] thickest woods, they visit us about one month latter [*sic*] than the other. This bird has not been described.' (HSP, coll. 0481)

Peale was likely referring to the species that Wilson (1810: 81, Pl. 13) later described under the name '*Wood* Pewee Flycatcher' (my italics), distinguishing it from the common 'Pewee' (i.e., Eastern Phoebe), which arrives in Philadelphia more than a month earlier than Eastern Wood Pewee during spring migration. Wilson's description of its voice is also a good match for Eastern Wood Pewee ('calling out in a feeble tone, *peto wāy*; *peto wāy*; *pee way*'). For his 'Wood Pewee Flycatcher', Wilson (1810) recycled the scientific name '*Muscicapa rapax*', which Bartram (1791) and Barton (1799: 19) had previously applied to the 'Lesser crested Flycatcher' of Pennant (1785: 386), based on a non-extant and unidentified specimen from Nova Scotia. However, Wilson (1810) did not cite Bartram (1791) or Barton (1799). Therefore, according to the Code (ICZN 1999, Art. 11.6), the name *M. rapax* Wilson, 1810, is technically available because (1) 'A name which when first published in an available work [e.g., *M. rapax* Barton 1799] was treated as a junior synonym of a name then used as valid [*M. acadica* J. F. Gmelin, 1789] is not thereby made available' (i.e., *M. rapax* Barton is unavailable); and (2) Bartram's (1791) nomenclature is also unavailable, because it was suppressed on account of his occasional use of trinomials (ICZN 1957). However, although it is available, *M. rapax* Wilson, 1810, is not free from taxonomic entanglement because the

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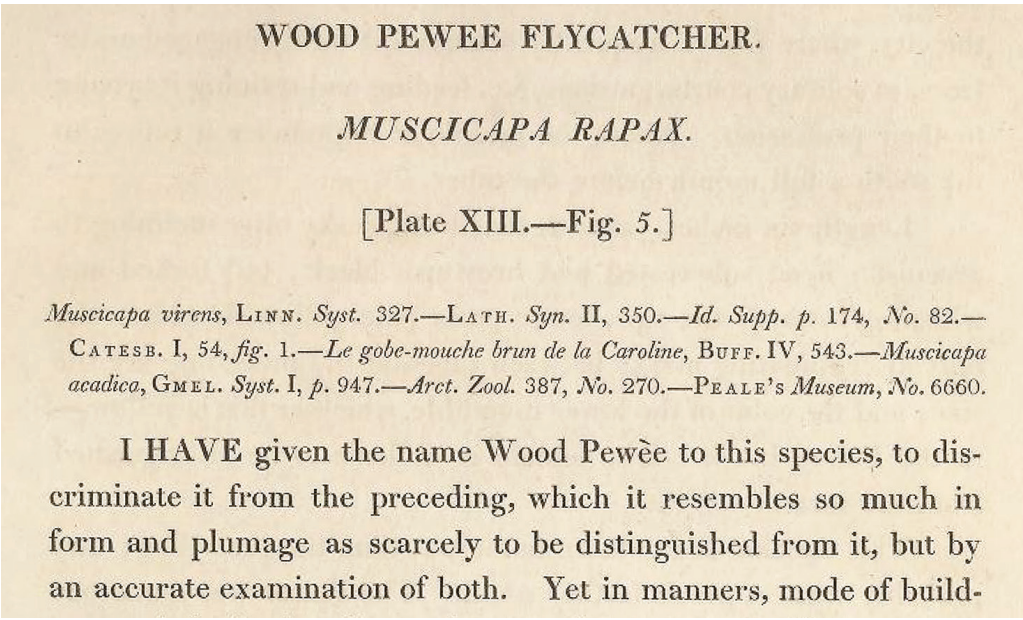

WOOD PEWEE FLYCATCHER.

MUSCICAPA RAPAX.

[Plate XIII.—Fig. 5.]

Muscicapa virens, Linn. *Syst.* 327.—Lath. *Syn.* II, 350.—*Id. Supp. p.* 174, *No.* 82.—Catesb. I, 54, *fig.* 1.—*Le gobe-mouche brun de la Caroline*, Buff. IV, 543.—*Muscicapa acadica*, Gmel. *Syst.* I, *p.* 947.—*Arct. Zool.* 387, *No.* 270.—Peale's *Museum*, *No.* 6660.

I HAVE given the name Wood Pewèe to this species, to discriminate it from the preceding, which it resembles so much in form and plumage as scarcely to be distinguished from it, but by an accurate examination of both. Yet in manners, mode of build-

Figure 8. First page of the original description of *Muscicapa rapax* Wilson, 1810. Courtesy of Smithsonian Institution Libraries and Biodiversity Heritage Library (www.biodiversitylibrary.org, accessed 13 March 2023).

composite '*Muscicapa virens* Linn.', and the unidentifiable *M. acadica* J. F. Gmelin, 1789, were listed among its synonyms (Fig. 8).

The type material of *M. rapax* Wilson, 1810, is also untraceable. Wilson (1810: 81) cited 'Peale's Museum, No. 6660' among the synonyms of *M. rapax*, which referred to a specimen or specimens in the Philadelphia Museum. Two data-deficient specimens of '*Myiochanes virens* (Linn.)' in the Museum of Comparative Zoology, Harvard University, Cambridge, MA (MCZ), which came from the historic Boston Museum collection, are alleged to have originated in Peale's collection (Faxon 1915: 144). However, there are lingering doubts about the provenance of this material (see Halley 2022: 234). Upon the dispersal of Peale's collection in the mid-19th century, some material was reportedly purchased by Moses Kimball (1809–95), which passed temporarily to the Boston Society of Natural History, then spent several years stored in a barn in Massachusetts. By the time the collection was accessioned at MCZ, in the early 20th century, the original mounts and labels had been disassociated from the specimens and an untold number were lost (Faxon 1915). Another portion of the Philadelphia Museum collection was sold to the circus promoter P. T. Barnum (1810–91) and subsequently destroyed in a fire at his 'American Museum' in New York City (Anon. 1865). There are no known contemporaneous catalogues or inventories of the Kimball and Barnum allotments, so we cannot be confident that any MCZ specimen was actually mounted in the Philadelphia Museum, let alone that it was the same specimen to which Wilson (1810) referred in his *M. rapax* account. After his death in 1813, the Philadelphia Museum continued to acquire new specimens until at least September 1839, when the last ornithological entry was made in the accessions ledger (HSP, coll. 0481); and there is evidence that the Peales periodically replaced older specimens of common local species, which were occasionally damaged by insects, to keep the exhibits looking fresh (see Miller 1988).

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Figure 9. DMNH 85602, the neotype of *Muscicapa virens* Linnaeus, 1766; see text for provenance (Matthew R. Halley)

Neotypification of *M. virens* Linnaeus, 1766

The name *Contopus virens* (Linnaeus) has been used for the Eastern Wood Pewee for more than 200 years, and is recognised as the type species of *Contopus* Cabanis, 1855. However, Brisson's (1760) measurements match a specimen in the genus *Empidonax*, unidentifiable to species, and Catesby's (1731) plate and description exhibit an inconsistent suite of characters, precluding identification. The bird in Catesby's original painting lacks prominent wingbars, and therefore resembles *Sayornis phoebe* more than *C. virens*. Furthermore, Linnaeus (1766) evidently miscopied a conspicuous plumage character—a white supercilium ('*superciliis albis*')—from a species in a different family (Vireonidae), the 'Red-eyed Fly-catcher' (= *Vireo olivaceus*), which appeared on the same plate as Catesby's (1731: 54) 'little brown Fly-catcher'. Therefore, despite its long use, the original description of *M. virens* Linnaeus, 1766, is not unambiguously identifiable. Its known type material evidently consisted of specimens from multiple passerine families and genera (Tyrannidae: *Empidonax*, *Sayornis*; and Vireonidae: *Vireo*, or Icteriidae: *Icteria*) and no specimen is extant or traceable. None of the type material can be unambiguously identified as the species now known as Eastern Wood Pewee. To my knowledge, this situation has not been previously discussed in literature, nor has any previous author designated a lectotype or neotype of *M. virens*.

Therefore, to fix the taxonomic identity of Eastern Wood Pewee *C. virens* (Linnaeus), in accordance with prevailing use, I hereby designate a neotype for *M. virens* Linnaeus, 1766. The neotype is an adult female (DMNH 85602) in the collection of the Delaware Museum of Nature & Science, Wilmington, DE, USA (Fig. 9). This action stabilises nomenclature and prevents confusion arising from alternative identifications. It satisfies the requirements for neotype designation in the Code (ICZN 1999) by clarifying the taxonomic application (status) of the name (Art. 75.3.1), describing, illustrating and referencing the defining characters of *C. virens* and its neotype (Art. 75.3.2), providing data sufficient to ensure recognition of the neotype specimen (Art. 75.3.3), providing grounds for believing that all original type material has been lost and is untraceable (Art. 75.3.4), showing that traits of the

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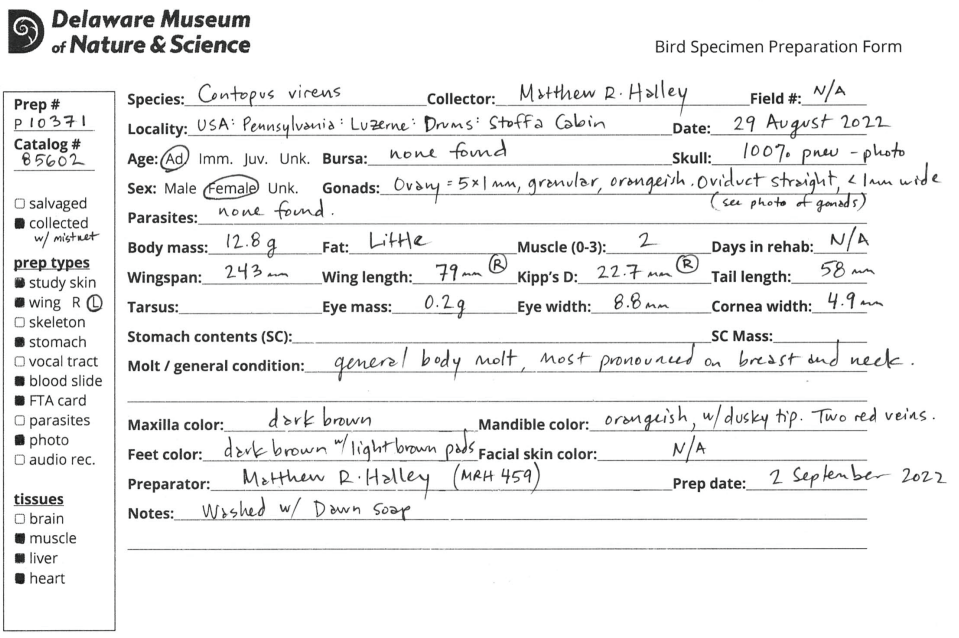

Delaware Museum of Nature & Science

Bird Specimen Preparation Form

Prep # P10371
Catalog # 85602

☐ salvaged
■ collected w/ mistnet

prep types
■ study skin
■ wing R (L)
☐ skeleton
■ stomach
☐ vocal tract
■ blood slide ×2
■ FTA card
☐ parasites
■ photo
☐ audio rec.

tissues
☐ brain
■ muscle
■ liver
■ heart

Species: Contopus virens Collector: Matthew R. Halley Field #: N/A
Locality: USA: Pennsylvania: Luzerne: Drums: Stoffa Cabin Date: 29 August 2022
Age: (Ad) Imm. Juv. Unk. Bursa: none found Skull: 100% pneu - photo
Sex: Male (Female) Unk. Gonads: Ovary = 5×1 mm, granular, orangeish. Oviduct straight, < 1mm wide (see photo of gonads)
Parasites: none found.
Body mass: 12.8 g Fat: Little Muscle (0-3): 2 Days in rehab: N/A
Wingspan: 243 mm Wing length: 79 mm (R) Kipp's D: 22.7 mm (R) Tail length: 58 mm
Tarsus: Eye mass: 0.2 g Eye width: 8.8 mm Cornea width: 4.9 mm
Stomach contents (SC): SC Mass:
Molt / general condition: general body molt, most pronounced on breast and neck.
Maxilla color: dark brown Mandible color: orangeish, w/ dusky tip. Two red veins.
Feet color: dark brown w/ light brown pads Facial skin color: N/A
Preparator: Matthew R. Halley (MRH 459) Prep date: 2 September 2022
Notes: Washed w/ Dawn soap

Figure 10. Original data form used during preparation of DMNH 85602, neotype of *Muscicapa virens* Linnaeus, 1766 (Matthew R. Halley)

neotype are included in the original description (Art. 75.3.5), choosing a neotype collected on the breeding grounds of *C. virens*, in eastern North America, where the syntypes that served as the models for Brisson (1760) and Catesby (1731) were presumably collected (Art. 75.3.6), and depositing the neotype in a recognised scientific institution (Art. 75.3.7).

Collection of the neotype.—DMNH 85602 is an adult female (study skin and spread left wing) collected on private property ('Stoffa Cabin') at 274 Freedom Road, Drums, Luzerne County, Pennsylvania, USA (41°1'0.62"N, 75°56'29.86"W). At 08.00 h, on the morning of 29 August 2022, I captured the bird in a mist-net. I drew approximately 50 µL of blood via brachial venipuncture into a microhematocrit capillary tube. I immediately smeared blood droplets on two glass slides, then fixed them in pure methanol. I also applied blood drops to an FTA card, which I stored in a sealed plastic bag with silica desiccant beads. I euthanised the bird via cardiac compression, then transported the body on ice to DMNH, where I placed it in a storage freezer (–20ºC) until I prepared the specimen.

The type locality ('Stoffa Cabin') is a mixed deciduous-conifer woodland with a colonial history of human disturbance including residential development and selective logging. It is located near the headwaters of the Little Nescopeck Creek, and named for a cabin constructed there in the 1980s by my grandfather, Francis J. Stoffa, Sr. (1931–99). Eastern Wood Pewee is a common summer resident and breeder in the woods at Stoffa Cabin, and I heard its familiar song during field work there on 13 August 2022 (one singer), 28 August (two) and 29 August 2022 (two, both singing after I collected DMNH 85602). On those dates, I did not detect any species except those that breed regularly on the property. I did not hear *C. virens* when I returned to the site for several hours of field work on 24 September. Therefore, it is likely that DMNH 85602 was a member of the breeding population at Stoffa Cabin, collected just prior to its migration, and not a southbound migrant collected at a stopover site, although this is not known for certain. In this case, choosing a breeder for the neotype is not imperative because no geographic variation is known or described in the

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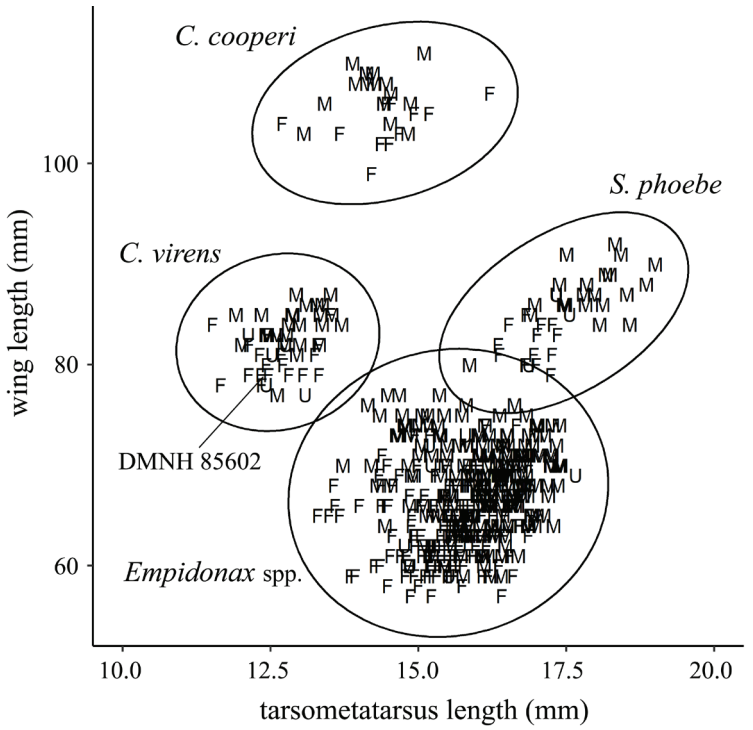

Figure 11. Variation in wing and tarsometatarsus length among eight tyrant flycatcher (Tyrannidae) species that occur regularly in eastern North America (*Empidonax* spp., *Contopus virens*, *C. cooperi*, *Sayornis phoebe*), from a sample of study skins in the DMNH collection (n = 519). Data from *Empidonax alnorum* and *E. traillii* were combined into a single category (*E. traillii s. l.*, see text). The sex class of each specimen is shown (F = female, M = male, U = unknown). The neotype of *C. virens* (DMNH 85602) falls clearly within the *C. virens* cluster. Ellipses were estimated using the 'geom_mark_ellipse' function in the 'ggforce' package in R-Studio (R Core Team 2020).

monotypic *C. virens* (Watt *et al*. 2020) nor is there evidence that Catesby's (1731) or Brisson's (1760) original descriptions were based on breeding birds.

Preparation of the neotype.—Four days later (2 September 2022), I prepared the study skin and sampled tissues (Fig. 10, prep. = MRH459). The bird was undergoing general body moult, most pronounced on the breast and neck. I did not find any parasites, despite fumigation with ethyl acetate and ruffling of each feather tract. I measured the wings and tail from the fresh (pliable) body with a metric ruler or dial callipers, as noted. Max. wingspan was 243 mm (ruler); the length of the closed and flattened right wing from the carpal joint to the tip of the longest primary was 79 mm (ruler); with the wing closed, the distance between the tips of the longest primary and first secondary ('Kipp's distance'; Kipp 1959) was 22.7 mm (callipers); the length of the tail, from the insertion point of the two central rectrices to the tip, was 58 mm (ruler). I measured the wing length again on 22 March 2023, by which time the study skin had been dried for over six months; it had decreased slightly to 78.5 mm.

The ovary measured 5 × 1 mm (ruler), was an orangey colour and had a granular texture. The oviduct was straight and < 1 mm wide (ruler). The skull was 100% pneumatised. No bursa was found. The stomach was saved and refrozen for a forthcoming dissection. There was a small amount of fat in the dorsal tract and around the furcula. Measured with dial callipers, the widest diameter of the (wet) left eye was 8.8 mm, after removal from the skull, and the diameter of the corneal 'bulge' was 4.9 mm. I collected samples of the breast muscle, liver, and heart tissue (DMNH P10371) in 95% ethanol and placed them in the

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storage freezer (–20ºC). I also deposited backup tissues at the Academy of Natural Sciences of Drexel University (Philadelphia, PA).

Diagnosis.—Eastern Wood Pewee *C. virens* (Linnaeus) is distinguished morphologically from the five *Empidonax* (Tyrannidae) that regularly occur in eastern North America (see above) by its combination of a longer wing and shorter tarsometatarsus (Fig. 11, Pyle 2022: 257), and, from *Sayornis phoebe*, by its shorter tarsometatarsus (Fig. 11) and pale mandible (vs. black in *S. phoebe*).

Acknowledgements

This paper is dedicated to the memory of Francis J. Stoffa, Sr. (1931–99), who imparted his curiosity about birds to his grandson. My grandmother, Dorothy Mae (Murman) Stoffa, kindly permitted me to collect specimens at Stoffa Cabin. The neotype (DMNH 85602) was collected under US Fish & Wildlife Service permit no. MBPER0036206 and Pennsylvania Game Commission permit no. 55967. I am grateful to Guy M. Kirwan, Edward C. Dickinson, and Frank Steinheimer for commenting on early drafts of the manuscript. Patrick Boussès assisted by searching the MNHN collection for Brisson's (1760) type material. Mass data obtained via VertNet.org were sourced from specimens in the following institutions: California Academy of Sciences, San Francisco (CAS); Chicago Academy of Sciences (CHAS); Carnegie Museum of Natural History, Pittsburgh (CM); Cleveland Museum of Natural History (CMNH); Charles R. Conner Museum, Moscow (CRCM); California State University, Chico Vertebrate Museum (CSUC); Cornell University Museum of Vertebrates, Ithaca (CMUV); Denver Museum of Nature & Science (DMNS); University of Kansas Biodiversity Institute, Lawrence (KU); Natural History Museum of Los Angeles County (LACM); Museum of Comparative Zoology, Harvard University, Cambridge (MCZ); Bell Museum of Natural History, St Paul (MMNH); Museum of Southwestern Biology, Albuquerque (MSB); Museum of Vertebrate Zoology, University of California, Berkeley (MVZ); Natural History Museum, Tring (NHMUK); Museum of Biological Diversity, Ohio State University, Columbus (OSUM); Royal Ontario Museum, Toronto (ROM); South Australian Museum, Adelaide (SAMA); Texas A&M University Biodiversity Research and Teaching Collections, College Station (TCWC); University of Arkansas Collections Facility, Fayetteville (UAFMC); Museum of the North, University of Alaska Fairbanks (UAM); University of British Columbia Beaty Biodiversity Museum, Vancouver (UBCBBM); University of California, Los Angeles (UCLA); University of Michigan Museum of Zoology, Ann Arbor (UMMZ); University of Washington Burke Museum of Natural History and Culture, Seattle (UWBM); University of Wyoming Museum of Vertebrates, Laramie (UWYMV); Western Foundation of Vertebrate Zoology, Camarillo (WFVZ); Western New Mexico University, Silver City (WNMU); and Yale University Peabody Museum, New Haven (YPM). Many thanks to the curatorial staff of these collections.

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ISSN-2513-9894 (Online)