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IDENTIFICATION OF THE FLYCATCHERS OF EASTERN NORTH AMERICA, WITH SPECIAL EMPHASIS ON THE GENUS *EMPIDONAX*

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Among eastern birds, the flycatchers are notoriously difficult to identify. Vague identifications or unqualified errors occur not infrequently in the genus *Empidonax*, and we have personally seen banders identify wood pewees as *Empidonaces* and vice versa. Part of the problem lies in the fact that most of us are more familiar with birds in the field than we are with birds in the hand, where they give none of the behavioral clues that aid us in field identification. For this reason, banders have a special need for useful keys. But unfortunately the available texts and keys often lack vital information on when and where to expect a given species, and they commonly neglect juvenal plumages and plumage sequences. Some keys in common usage place undue emphasis upon single characters which, because of their variability, should only be used as corroborative evidence. A case in point is the often-quoted distinction between two groups of *Empidonaces* based solely on back coloration, which has inadvertently led to the misidentification of some green-backed Traill's Flycatchers as Acadian Flycatchers. Banders should thus find useful a new key and summary of pertinent information which covers all plumages of all eastern flycatchers, *i.e.* those species normally found anywhere east of the Great Plains and north of southernmost Texas, and including those extralimital species for which there are a number of specimens taken in the east. The nomenclature used is that of the A. O. U. Check-list of North American Birds (1957).

The key emphasizes characters visible in the living bird but not often mentioned in the literature, such as color of mouth lining, and also considers the times and places where certain species are *not* to be expected. Its use requires no more than an accurate caliper and a millimeter ruler. With these aids, and a careful reading of *all the characters*, we believe that 98 per cent or more of all the full-grown birds netted can be readily keyed out, even in the difficult genus *Empidonax*.

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Most of the key and the characters used therein were formulated by Phillips on the basis of a long-standing interest in and experience with the special problems afforded by the flycatchers (Tyrannidae). From 1961 through 1965, the key was used by college undergraduates participating in an ornithological research program at the American Museum of Natural History's Kalbfleisch Field Research Station at Huntington (Long Island), New York, under Lanyon's supervision. Special attention was given to its practicability in the identification of fall migrants and especially of *Empidonax*. In 1964 and 1965, Howe and Lanyon accumulated data on sexual dimorphism in *Empidonax*, through laparotomy of birds netted, banded, and later released.

USE OF THE KEY

Identifying flycatchers is tricky. Before trying, be sure you understand how to use the key, how to take proper measurements, and above all what is and is not included in the key. Read it through several times to see how it works.

In summer, the *first point* to check is always the bases of the shafts of the long wing and tail feathers—the "flight feathers". If all or nearly all of these flight feathers are enclosed in swollen, cylindrical sheaths at their bases, your bird is not fully grown and hence our key will not work. The young bird must normally be identified by the agitated parents that may try to rescue it. If only *certain* flight feathers are sheathed, and these are symmetrical in both wings or on both sides of the tail, your bird is an adult in normal molt, for immature flycatchers of those species that occur regularly in eastern North America do not renew their flight feathers during their first summer or fall. A molting adult flycatcher, if it is smaller than a phoebe, is pretty surely an Acadian or a Yellow-bellied Flycatcher, for adults of the other small species migrate before they renew their flight feathers.

There are two instances where the key does not distinguish species. (1) Eastern and Western Wood Pewees are keyed out together, because they differ so slightly that many birds can not be identified without good comparative series of the two. Adult pewees become so faded and worn after June, in many cases, as to defy identification even in the museum. (2) No attempt is made to distinguish the two song-types of Traill's Flycatchers, which are probably sibling species (Stein, 1963). If you are interested in these especially difficult problems of identification, see the "Comments on Species" that follow the key.

If you think that your bird is *not* in the key or that it is of a species which, according to the key, should not be in your area at that season, give serious consideration to preserving it for permanent study as a specimen in your local, state, or national museum. Remember how infinitesimal are the chances of a recovery of the banded bird, and even if you did get a miraculous return or recovery, it would be meaningless as long as there were any doubt as to the specific identification. On the other hand, if the bird is properly prepared for study, with the sex and age carefully determined and

the colors of the mouth and other "soft parts" recorded, it will then be available for study by specialists at any time. We particularly urge that any exceptionally late small flycatcher, *i.e.* after early October in Canada or the northern United States and after early November farther south, be preserved. Such stragglers may well include some western species. Permanent preservation of great rarities for your area is always highly desirable, especially where the species are hard to identify. For a key to the western species of *Empidonax*, see Phillips, Marshall, and Monson (1964).

Simplified terms have been used in the key in lieu of more cumbersome statements of statistical reliability, though we have included some statistical treatments of mensural characters in the section following the key. Our term "nearly always" is roughly equivalent to the statement that "98 out of 100 individuals may be expected to be so characterized", and our term "usually" is roughly equivalent to the statement that "85 out of 100 individuals may be expected to be so characterized", based on the material analyzed.

The following terms, arranged alphabetically, are used in the key. It is important to understand them and to use them correctly.

Crown-patch: an area of brightly-colored feathers in the center of the top of the head, usually concealed in life in our species that have it.

Eye-ring: complete, or nearly so, "ring" of contrastingly pale feathers borne around (just outside of) the fleshy eyelids.

Formula B: see comments under *Wing shape*.

Mouth, color of: color of the inner surfaces of the upper and lower mandibles.

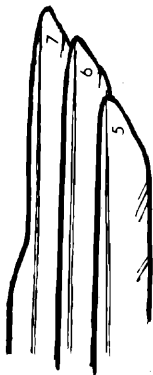
Primaries: the long, outermost wing feathers, forming the tip of the wing; numbered from the inside out, with the outermost being number ten; see comments under *Wing shape*.

Rectrices: the long feathers of the tail, comprising six pairs in all (singular = *rectrix*).

Sixth primary cut out: the outer web (leading edge) of the sixth primary (fifth from the outside) is emarginated like that of number seven, *i.e.* it narrows abruptly as illustrated in figure 1. To determine this, the sixth primary should be drawn back gently and pressed lightly against the seventh primary for comparison. In some individuals, an intermediate category may be necessary, which we call *sixth primary slightly cut out*; here, the emargination is only barely discernible but nevertheless appears to be real. Occasionally the effect of slight emargination is an artifact due to an abnormal arrangement of the feather barbs.

Sixth primary not cut out: the outer web of the sixth primary is normal, even, not emarginated as described above, being in direct contrast with the condition illustrated by the seventh primary in this respect (fig. 1).

FIG. 1. Some primaries from the right wings of *Empidonax* flycatchers, illustrating terms used in the key that refer to the extent of emargination of the sixth primary. Comparison of the leading edge of the sixth primary with that of the seventh primary (which is always cut out) will facilitate the selection of the appropriate term.



Sixth Primary Not Cut Out as in *E. traillii*, *E. virescens*, and some *E. flaviventris*

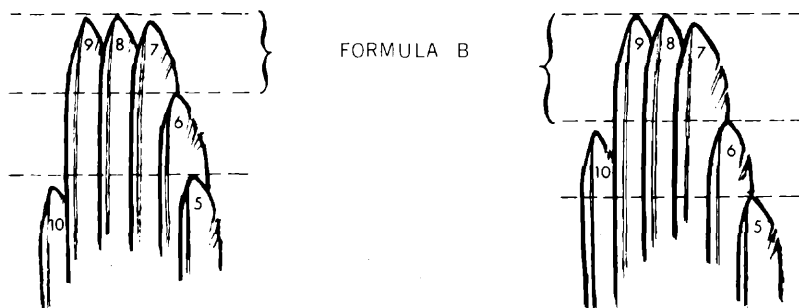


Sixth Primary Slightly Cut Out as in some *E. minimus* and some *E. flaviventris*



Sixth Primary Cut Out as in most *E. minimus* and some *E. flaviventris*

FIG. 2. Differences in wing shape in *Empidonax* flycatchers, as determined by the relative lengths of the longest primaries when the wing is held in a closed position alongside the bird's body. Formula B is the distance between the tip of the sixth primary and the tip of the longest primary.



Rounded Wing of

E. minimus, in which the 10th primary is usually equal to or shorter than the 5th (as illustrated above)

and of

E. flaviventris, which has the 10th primary usually equal to or longer than the 5th, but in which formula B is usually 5.0 mm. or less.

Pointed Wing of

E. virescens, in which formula B is usually 6.0 mm. or more

and of

E. traillii, in which formula B is usually less than 6.0 mm.

In both of these species, the 10th primary is usually equal to or longer than the 5th (as illustrated above)

Wing: the normal, resting wing measured (the chord) from the front of its bend to the tip of the longest primary. The feathers should *not* be pressed or distorted in any way. The wing is best measured either with dividers or with a ruler specially equipped with a vertical bar affixed perpendicularly at the zero point.

Wing shape: as determined by the relative lengths of the longest primaries (fig. 2). The wing must be held in its normal, closed position alongside the body, without any distortion of the primaries. If one primary is broken, use the other wing. In most flycatchers, primaries seven to nine are the longest. One measurement of wing shape is herein designated as *formula B*: the difference between the longest primary and primary number six (fifth from the outside), as determined by the distance, in millimeters, from the tip of the sixth primary to the tip of the wing (usually 3 to 10 millimeters in our key).

Wing-bars: formed by the contrast of pale, abrupt tips of the greater and middle wing-coverts with the rest of the dark wing.

KEY TO EASTERN FLYCATCHERS

A. Medium-sized or large; wing 75 mm. or more, usually over 80 mm. Without conspicuous or complete eye-rings and often without definite wing-bars. Crown brownish, sooty, blackish,

or pale gray (occasionally red, or with a concealed patch of yellow, orange, or orange-red), never greenish unless the tail and outer edges of the primaries are largely cinnamon-rufous

.....I.
[if not as above, see A' on page 161]

I. No bright orange, pink, or red on under parts, the belly at most yellow or tawny; no definite streaks on chest, or, if so streaked, wing more than 95 mm.....a.
[if not as above, see I' on page 161]

a. Medium-sized; wing usually 90 mm. or less (rarely over 91 mm.). No bright yellow, tawny, or rufous anywhere. No brown-patch1.
[if not as above, see a' below]

1. Bill all blackish; long (much longer than its width at the base). Wing of normal rounded shape (10th primary shorter than 5th, 9th shorter than 7th). Basal half of outer web of outer rectrix whitish, contrasting to rest of tail. (Common, from mid-March to early November generally, except south of northern parts of Georgia, Alabama, and Mississippi; winters, chiefly in southern states)

EASTERN PHOEBE

(*Sayornis phoebe*)

1'. Lower mandible pale, at least on basal part; bill a broad triangle, nearly as wide at base as it is long, Wing pointed (10th primary longer than 6th, 9th decidedly longer than 7th). Tail uniformly dark. (Absent in winter. Common from mid-May to early October generally, from early April to early November in extreme southern states; absent from immediate Gulf coast, much of Florida, and possibly adjacent southeastern Georgia from early or mid-June to late July or early August)

WOOD PEWEES

(*Contopus* spp.)

a'. Larger; wing usually over 97 mm.; if under 95 mm., inner webs of the rectrices and most of the outer edges of the primaries are conspicuously cinnamon-rufous. Plumage of variable coloration (tail sometimes black; belly sometimes yellow or tawny).....2.

2. Rectrices and primaries with cinnamon-rufous, as described above (Genus *Myiarchus*).....B.
[if not as above, see 2' on page 159]

B. The common summer species. Lower mandible drab or horn-color, at least basally. Forehead, crown, and upper parts more or less olive, distinctly *greener* than (contrasting sharply with)

the gray cheeks and lores. Chest, throat, chin, and malar area pale gray. Inner web of outer rectrix cinnamon-rufous all the way to its tip; some individuals may have a narrow stripe of fuscous or brownish-gray separating the cinnamon-rufous from the shaft, but this stripe, if present, does not expand abruptly at the tip of the inner web. Belly pale to bright yellow. (Common, from early May to late September generally, arriving in late March and early April in the south; a few winter in southern Florida)

GREAT CRESTED FLYCATCHER
(*Myiarchus crinitus*)

B'. A western species. Bill entirely black or dusky. No green tinge to plumage (gray-brown above). Chest and throat grayish-white. Inner web of outer rectrix cinnamon-rufous, but usually with a dull tip (fuscous or brownish-gray) except in badly worn birds or in immatures in juvenal plumage. Belly very pale yellowish or whitish. (Only a straggler east of central Texas, chiefly in fall and winter)

ASH-THROATED FLYCATCHER
(*Myiarchus cinerascens*)

2'. Plumage wholly dull or black, except often a concealed crown-patch in adults; without rufous (at most a tawny belly)

C. Under parts, including flanks, largely plain white; unstreaked (may have a dusky band across the chest)
[if not as above, see C' on page 160]

II. Color of back pale gray; rectrices without prominent white tips
[if not as above, see II' below]

b. Crown blackish (except for concealed yellow crown-patch in adults) or brownish (juvenal plumage), sharply set off from pale gray back. Outer rectrices extremely long in adults. (Accidental visitor from South America)

FORK-TAILED FLYCATCHER
(*Muscivora tyrannus*)

b'. Crown pale gray (except for concealed orange or orange-red crown-patch in adults), not contrasting with color of back. Outer rectrices not extremely long. (Coasts and islands of Florida)

and nearby states; summer only).....

GRAY KINGBIRD
(*Tyrannus dominicensis*)

- II'. Color of back dark gray or bluish gray. Crown dark gray to black (except for concealed orange or orange-red crown-patch in adults). All rectrices, or at least the outer ones, broadly tipped with white. (Common, early May to mid-September in north, October in south).....

EASTERN KINGBIRD
(*Tyrannus tyrannus*)

- C'. Under parts not largely white, but rather with yellow or tawny belly, *or*, sides and flanks heavily streaked with brown.....III.

- III. Lower mandible pale, especially at base. Throat and belly whitish, sometimes washed with yellowish, and connected by a narrow median line of whitish down the breast, separating (and sharply contrasting with) the dark sides and flanks. (Wide spread but uncommon in summer and migrations, late May to mid-September in north; very rare on coastal plain of southeastern United States, where found chiefly in fall)

OLIVE-SIDED FLYCATCHER
(*Nuttallornis borealis*)

- III'. Bill entirely blackish. Under parts not as above. Tail largely or wholly black (Chiefly western)

- c. Belly yellow. Outer vanes of outer rectrices prominently white. Larger; wing over 113 mm. Crown pale gray, with concealed crown-patch in adults. (Breeds in mid-west, but a few reach the east coast regularly in fall and winter)....WESTERN KINGBIRD....
(*Tyrannus verticalis*)

- c'. Belly tawny, not yellow. Outer rectrices without prominent white. Smaller; wing under 113 mm. Crown dark brownish-gray, without crown-patch. (Only a casual visitor east of the Great Plains)

SAY'S PHOEBE
(*Sayornis saya*)

- I'. Sides, flanks, and/or belly red, pink, or orangeish; or else, breast finely but definitely *streaked* with dusky brownish on a white background and wing less than 90 mm.d.
- d. Medium-sized. Rectrices short and broad, wholly dark (grayish or brownish). Streaks on the breast, or else, under parts and crown largely or entirely red. (Rare fall and winter visitant from the southwest, usually near water)

VERMILION FLYCATCHER
(*Pyrocephalus rubinus*)

- d'. Large; nearly kingbird size. Somewhat like a Western Kingbird, but rectrices narrow, black and white, and the outer ones extremely long in adults. Conspicuous reddish patch under the wing, and sides and flanks usually colorful, but not rest of under parts. Crown pale gray (adults with small concealed orange or red patch). Breast unstreaked. (Common summer resident, through October, in Texas and southern Great Plains; rare straggler elsewhere)

SCISSOR-TAILED FLYCATCHER
(*Muscivora forficata*)

- A'. Small; wing not over 82 mm., usually under 75 mm.; if over 77 mm., the crown is tinged with green. Usually with definite eye-rings and wing-bars. Crown dull grayish or brownish, olive, or greenish. No red, orange, or cinnamon-rufous anywhere, and no streaks. (Genus *Empidonax*).....IV.

- IV. Sixth primary always cut out, though only slightly so in a few individuals (fig. 1). Wings short and rounded; always less than 69 mm., and usually less than 65 mm., with 10th primary usually equal to or *shorter* than the 5th (fig. 2 and table 1). Tail notched, *i.e.* central rectrices distinctly (though often slightly) shorter than the adjacent rectrices and seldom longer than the outermost. Bill narrow, its width across the middle of the nostrils nearly always 5.5 mm. or less. Throat white, no yellowish cast. Crown dull grayish, no greenish cast. (Common breeder or transient in most regions, but a very rare fall transient in Florida and the South Atlantic lowlands; wintering casually).....

LEAST FLYCATCHER
(*Empidonax minimus*)

- IV'. Sixth primary not cut out (fig. 1), or, if sixth is cut out, the throat is pale grayish, more or less washed with yellow (*flaviventris*). Wings more pointed and often longer, usually over 66 mm. (never less than 62 mm. if the throat is white; sometimes as little as 60 mm. if the throat is yellowish); 10th primary nearly always equal to or *longer* than the 5th (fig. 2). If the throat is white, the bill is usually wider (over 5.5 mm.) and the tail is even, slightly rounded,

or double-rounded (the central pair of rectrices is usually slightly longer than the outermost, and commonly is as long as *any* other rectrix).....e.

- e. Throat pale grayish, more or less washed with yellow; the whole plumage tinged with yellow and green, except in some immatures in juvenal plumage. Mouth orangeish. Wing not excessively pointed; formula B usually 5.0 mm. or less, as in figure 2. (Status like *minimus* above, but rarely found in United States or Canada between the end of September and early May; no winter record)

YELLOW-BELLIED FLYCATCHER

(*Empidonax flaviventris*)

- e'. Throat white; or, if throat is washed with clear yellow (some *virescens* in fall), formula B is nearly always over 5.5 mm. and usually 6.0 mm. or more, as in figure 2, and mouth is duller (flesh-color to yellow), particularly in adults

3. Mouth flesh-color to yellow; tarsi (legs) gray. Crown and back gray-green to greenish, with little or no brown or dull olive tinge. Throat white, or sometimes washed with clear yellow. Wing more pointed; formula B nearly always over 5.5 mm. and usually 6.0 mm. or more (fig. 2, and table 3). Wing-bars much alike in color. *In late summer*, immatures in juvenal plumage have rump and back "scaly", *i.e.* the feathers have pale tips, and adults molt *all* the flight feathers, the species being unique in these respects among eastern members of the genus. (Breeds in the southeast, north into Michigan, Ontario, and very rarely to New England; chiefly from Ohio, Pennsylvania, and central New Jersey south, and not to be expected regularly on migration farther north, nor in the United States in winter) ACADIAN FLYCATCHER.....

(*Empidonax virescens*)

- 3'. Mouth bright orangeish; tarsi blackish. Back usually dull olive or brownish (though some individuals may have a greenish tinge in fall), and crown similar but darker. Throat white in all plumages. Wing more rounded; formula B nearly always less than 7.0 mm. and usually less than 6.0 mm. (fig. 2, and table 4). Anterior wing-bar often decidedly darker and duller than the posterior. Plumage never "scaly", as described above. Undergoes no regular molt in our area. (Breeds or migrates over North America generally, from mid- or late May through September; lingers in the deep south into early October, but unknown there in

spring east of the Mississippi River, and absent at all seasons from peninsular Florida)

TRAILL'S FLYCATCHER
(*Empidonax traillii*)

COMMENTS ON SPECIES

Banders who handle numbers of the smaller flycatchers may find the following comments useful, including notes on geographical and seasonal distribution, peculiarities of molt, and further remarks on identification.

For the *Empidonax* flycatchers there are additional data on sexual dimorphism, age and sex ratios, and migration schedules. These data were derived solely from late summer and early fall migrants netted at the Kalbfleisch Field Research Station on Long Island, New York, and hence will be especially applicable to Operation Recovery stations. Birds were aged by an examination of the degree of ossification of the skull, the condition of the plumage, and color of the wing-bars (the skull alone is not always 100 per cent reliable for determining age in flycatchers). Many of them were sexed by laparotomy. By including these data on sexual dimorphism, we do not mean to encourage or even suggest that banders record sex of their *Empidonax*. Our purpose is to demonstrate the extent of this dimorphism and to place the data on record for possible use in facilitating the specific identification of "problem birds". It should be noted that the wing measurements used in these analyses (and that appear in the tables) were of the *flattened* wing (arc), whereas the references to wing length in the foregoing key were to the chord of the curved wing. Flattened wing measurements in *Empidonax* usually average 0.5 mm. longer than measurements of the chord.

WOOD PEWEES *vs.* EMPIDONACES

Though our key should permit an accurate distinction between virtually all individuals of these two groups, it is conceivable that an especially short-winged pewee might be misidentified as an especially long-winged *E. traillii* because of an uncertainty as to the completeness or conspicuousness of the eye-ring. Fortunately there is an additional character which the bander can use when in doubt and which we were unable to work into the key in its present format. All North American wood pewees have a more pointed wing than do our Empidonaces, *i.e.* the 10th primary is longer than the 6th, whereas all of our Empidonaces (except some individuals of the greenish *virescens*) have the 10th primary shorter than the 6th. Distinction between these two groups should no longer be a problem to banders.

LEAST FLYCATCHER, *Empidonax minimus*

This, the hardiest *Empidonax*, is the most numerous one in the northern United States and Canada after mid-September and almost the only white-throated one after that date, particularly at Operation Recovery stations in the northeast. It is likewise the only one to be expected here before mid-May, and the only one known to have wintered in the United States east of Arizona. In

TABLE 1. SEXUAL DIMORPHISM IN LENGTH AND SHAPE OF WING (IN MILLIMETERS) OF IMMATURE *Empidonax minimus* NETTED AT THE KALBFLEISCH STATION

Total sample:	Sample Size	Mean, S.E.	Range	Standard Deviation
Wing length (arc)	74	61.5 ± .27	57-67	2.30
Formula A (5th-10th)	31	+1.45 ± .23	(-1.4)-(+3.6)	1.30
Males:				
Wing length (arc)	23	63.9 ± .24	62-66	1.16
Formula A (5th-10th)	16	+1.17 ± .29	(-1.4)-(+3.6)	1.18
Females:				
Wing length (arc)	32	60.1 ± .22	57-62	1.24
Formula A (5th-10th)	14	+1.93 ± .27	(0.0)-(+3.6)	1.02

spring its usual southeastward limit seems to be northern Alabama.

At Kalbfleisch. Most individuals of this species were grayish on the back, but an occasional bird had a noticeable tinge of green. All had whitish-gray throats, however, with no trace of yellow. Emargination of the sixth primary was characteristic of all 110 birds netted, with the majority of birds having the sixth strongly cut out and the remaining birds having the sixth slightly cut out.

Wing length alone separated the sexes in all but those birds (11 per cent of the sample) having a wing of 62 mm. Since there is some sexual dimorphism in wing shape, the following equation improves separation of the sexes:

$$\text{Wing length} = 61.8 + .13 A$$

where formula A is the distance between the tips of the 5th and 10th primaries, measured with calipers to the nearest 0.1 mm. and expressed as the mathematical difference of the "5th primary minus the 10th primary". This equation correctly separated the sexes in 93 per cent of the Kalbfleisch sample of laparotomized birds, with males exceeding the value so derived (see table 1 for actual measurements).

Fall migration of *minimus*, during the period 1960 through 1965, extended from 10 July to 15 September and peaked during the last week of August and the first week of September. Generally the migration first became evident about the first of August. Two July records (10th, 16th) were nearly two weeks earlier than the next record, were both adult birds, and may have represented post-breeding stragglers. With the exception of these two adults, all of the 110 individuals of *minimus* netted at the Station have been immature. Sex ratios have been consistently near 1:1 and there has been no evidence of a differential migration pattern between the sexes.

YELLOW-BELLIED FLYCATCHER, *Empidonax flaviventris*

Its essential character, despite the name, is the definite yellow wash over the chest and *throat*. This is possibly diagnostic in spring,

TABLE 2. SEXUAL DIMORPHISM IN LENGTH AND SHAPE OF WING (IN MILLIMETERS) OF IMMATURE *Empidonax flaviventris* NETTED AT THE KALBFLEISCH STATION

Total sample:	Sample Size	Mean, S.E.	Range	Standard Deviation
Wing length (arc)	46	64.8 ± .37	60 - 69	2.51
Formula J (6th-10th)	37	+3.74 ± .15	(+1.6)-(+5.7)	0.94
Males:				
Wing length (arc)	14	67.3 ± .28	65 - 69	1.04
Formula J (6th-10th)	14	+3.31 ± .26	(+2.0)-(+5.5)	0.96
Females:				
Wing length (arc)	22	62.8 ± .30	60 - 66	1.41
Formula J (6th-10th)	21	+4.08 ± .22	(+1.6)-(+5.7)	0.99

but our information on this point is inadequate; see our comments for the Acadian Flycatcher. In fall, in the Mississippi Valley and west, identification of *flaviventris* is tricky, as it overlaps other yellowish species. The wing-formulae given in the key and throat color should identify it while in our region.

Especially strange are the molts of *flaviventris*. Some adults may undergo considerable molt, occasionally including *all* of their primaries, before arriving on their wintering grounds in Middle America. Most adults, however, have only a partial prebasic molt in late summer which is not completed until after the migration. Commonly, 3 to 5 outer primaries are renewed before reaching Middle America. The extent to which the postjuvinal or first prebasic molt takes place before migration also needs study. These are good problems for Canadian ornithologists.

At Kalbfleisch. All individuals possessed a very greenish back and yellowish tinged (often strong) throat. About 80 per cent of the birds exhibited an emarginated sixth primary, ranging from slight to very marked; the rest had the sixth not cut out. It should be noted that having the sixth cut out at once separates those individuals of *flaviventris* from the Acadian Flycatcher.

Wing length alone separated the sexes in the majority of cases and the more pointed wings of the males made sexual determination even more accurate. The measurement used here for wing shape is formula J, the distance between the tips of the 6th and 10th primaries, measured with calipers to the nearest 0.1 mm. and expressed as the mathematical difference of the "6th primary minus the 10th primary". The equation of the line that separated the sexes best is:

$$\text{Wing length} = 63.4 + .42 J$$

This equation correctly separated the sexes in 97 per cent of the Kalbfleisch sample of laparotomized birds, with males exceeding the value so derived (see table 2 for actual measurements).

Extremes for fall migration of this species during the period 1962 through 1965 were 15 August and 26 September, with a peak

flight during the last week of August and the first week of September. Only two out of 73 birds were adult (97 per cent immatures). Both adults were in worn plumage, with no evidence of wing molt. One of the adults had some molt in the ventral tracts. Most of the immatures had apparently completed their prebasic (postjuvenile) body molt, though a few showed some molt of the contour feathers. During 1964 and 1965, females outnumbered males by 4:3, and there was no apparent differential migration pattern between the sexes.

ACADIAN FLYCATCHER, *Empidonax virescens*

This is the only flycatcher smaller than a phoebe which is known to molt completely in the eastern United States. Adults are recognizable, in the southern states in August, by the extremely fresh, full-rounded, dark inner primaries grading down through 1 or 2 successively shorter ones outwardly to the old, remaining outer primaries. The latter are older and more faded (paler and browner), and except for the outermost (tenth) at times, show somewhat worn or frayed tips. By early September, replacement is often complete, the only sign of molt being the swollen, sheathed bases of the shafts of the outermost one or two primaries, near the edge of the wing. A normal molt is recognized by its *symmetry* in the two wings, as well as by the regular outward progression.

Adult *virescens* in fall look much like adult *flaviventris*, but are usually whiter-throated. Fall immatures still differ from other small flycatchers in the definite contrast of buff tips to the dark primary coverts and tail feathers, and the broad (about 0.5 mm.), definitely buff (not pale yellowish or whitish) outer edge and tip of each secondary. Young *trillii*, at least of the northern "fee-bee-o" populations, have the primary coverts more or less tipped with pale olive, but not narrow, definitely buff tips.

Nearly all Acadian Flycatchers return in the spring with the throat white. There are, however, occasional sight records of "Yellow-bellied Flycatchers" in late April and early May in the extreme south, at least in Florida. From the dates, we suspect that these really represent Acadian Flycatchers which had not yet completed their spring prealternate molt. Specimens of these extremely rare individuals apparently do not exist and are *most urgently needed* to throw light on this problem. Meanwhile, early spring sight re-

TABLE 3. SUMMARY OF MENSURAL CHARACTERS FOR *Empidonax virescens* IN THE AMERICAN MUSEUM OF NATURAL HISTORY

	Sample Size	Mean, S.E.	Range	Standard Deviation
Wing length (arc)	80*	72.2 ± .35	64 - 81	3.15
Formula A (5th-10th)	48**	-3.83 ± .24	(-7.2)-(-0.3)	1.58
Formula B (long.-6th)	48**	+7.63 ± .15	(+5.8)-(+10.2)	1.06

*45 males, 29 females, 6 not sexed

**25 males, 19 females, 4 not sexed

records of Yellow-bellied Flycatchers in the southeast must be regarded with suspicion, no matter how expert the observers.

Though formerly more widely distributed, this species is now largely restricted to the southern and mid-western states and probably occurs only as a rare migrant at Operation Recovery stations to the north and east of central New Jersey. None have been netted or collected at the Kalbfleisch Station on Long Island in the seven years of its operation. Measurements taken from specimens of *virescens* at the American Museum of Natural History are presented in table 3 for comparative purposes.

The color of the lining of the mouth varies, in adults, from fleshy to pale, dull yellow, unlike the orangish lining of the other three species of *Empidonax* in the East. In some immatures the color is more definitely yellow and requires closer comparison. If banders become familiar with the mouth color of *minimus*, *traillii*, and *flaviventris*, they will then be able to recognize the duller mouth of *virescens*. The opportunity to make direct comparisons of *virescens* with the other species will facilitate the use of this character.

TRAILL'S FLYCATCHER, *Empidonax traillii*

On the basis of detailed and convincing studies by Stein (1963), this "species" is probably a composite of (1) the "Alder Flycatcher" ("*E. traillii*"), a northern bird with slightly greener sides of the head and neck, more pointed wings (sex for sex), and, on the average, a slightly shorter bill, and (2) the slightly duller, grayer, or browner "Willow Flycatcher" ("*E. brewsteri*") with opposite characteristics.

The "Willow Flycatcher" sings "fitz-bew" or "free-beer", with the opening syllable (occasionally lengthened to "fuhree") just as high-pitched and accented as the second. Its western races have the tenth primary slightly *shorter* than the fifth, but it is usually longer in our race, which was originally mid-western but has reached the eastern seaboard in New York and New Jersey in the present century.

The "Alder Flycatcher", on the contrary, sings "fee-bee-o" or "way-bee-o", with the *second* syllable highest-pitched and accented. The two forms build recognizably different nests and Stein (*op. cit.*) found no interbreeding between them on common nesting grounds in both New York and British Columbia.

Nevertheless, these song-types are too similar for banders to try to distinguish; all should be listed as "Traill's Flycatchers". Except possibly on the southernmost nesting grounds of the "fitz-bew" type in and near Arkansas, none of either type is to be expected anywhere in the eastern United States between mid-October and mid-May. In the northern states and Canada the stay is still shorter, with late May to late September being extreme dates.

At Kalbfleisch. The back coloration of this species varied from brownish to slightly greenish, but no bird had even a trace of yellow on the throat. The sixth primary was not cut out in all but one of 92 individuals. The one exception was judged to have the sixth primary only very slightly cut out.

TABLE 4. SEXUAL DIMORPHISM IN LENGTH AND SHAPE OF WING (in MILLIMETERS) OF *Empidonax traillii*¹ NETTED AT THE KALBFLEISCH STATION

	Sample Size	Mean, S.E.	Range	Standard Deviation
Total sample:				
Wing length (arc)	44	68.6 ± .41	63 - 74	2.74
Formula A (5th-10th)	60	-1.69 ± .13	(-4.8)-(+1.1)	1.00
Formula B (long.-6th)	60	+5.43 ± .08	(+4.0)-(+6.8)	0.64
Males:				
Wing length (arc)	21	70.7 ± .34	68 - 74	1.55
Formula A (5th-10th)	21	-1.70 ± .19	(-4.5)-(-0.3)	0.87
Formula B (long.-6th)	21	±5.73 ± .12	(+5.0)-(+6.6)	0.54
Females:				
Wing length (arc)	9	67.2 ± .62	65 - 71	1.86
Formula A (5th-10th)	9	-1.54 ± .35	(-3.5)-(-0.3)	1.05
Formula B (long.-6th)	9	±5.24 ± .23	(+4.1)-(+6.7)	0.69

¹This analysis is restricted to individuals identified as the northern, "fee-bee-o" song type, according to Stein's formula (1963). Most of these birds were immatures.

During the fall migrations of 1962 through 1965, all Traill's Flycatchers netted at the Kalbfleisch Station were tentatively classified in the Station's records as either "*traillii*" or "*brewsteri*" according to Stein's formula (*op. cit.*). Stein acknowledges that it is not possible to identify every individual of this complex on the basis of his formula alone (he claims approximately 90 per cent accuracy among specimens of known song-type), and our purpose in "testing" these criteria on the Long Island birds was to determine whether the results would be compatible with what one might expect on the basis of the known breeding ranges of the two song-types. All but three of 80 individuals were classified as "*traillii*", the exclusive song-type throughout most of New England. The three individuals classified as "*brewsteri*" were taken on 16 August, 20 August, and 3 September.

As in *minimus* and *flaviventris*, the males of *E. traillii* have longer and more pointed wings than do females. Because of insufficient numbers of "*brewsteri*", our analysis of sexual dimorphism is confined to individuals of "*traillii*" ("fee-bee-o" song-type). Maximum separation of the sexes was achieved with this equation:

$$\text{Wing length} = 70.9 - .27 (\text{B-A})$$

"B-A" is the mathematical difference, in millimeters, between formula B (longest primary minus the 6th) and formula A (5th primary minus the 10th). This equation correctly separated the sexes in 90 per cent of the Kalbfleisch sample of laparotomized birds, with males exceeding the value so derived (see table 4 for actual measurements).

Fall migration of *E. traillii* (in the broad sense), during the period 1961 through 1965, extended from 11 August to 18 September and peaked during the last week of August and the first week of September. Of 92 birds netted, 10 (11 per cent of this migrant popula-

tion) were adults. When sex was determined, males outnumbered females by 2:1, but there was no indication of a differential pattern of migration between the sexes.

EASTERN AND WESTERN WOOD PEWEES, *Contopus virens* and *C. sordidulus*

Except for the two forms of Traill's Flycatchers, the Eastern and Western Wood Pewees are easily the most difficult North American birds to distinguish with morphological characters alone. Visible differences between pewees are usually due to age, plumage, wear, and fading, rather than to the species involved. The Eastern Wood Pewee is, however, the only one to be expected with any regularity east of the 100th meridian. Just west of this, in western Manitoba, the two overlap at the extremes of their respective ranges. Another contact was recently discovered and is being studied by Dr. Lester L. Short, Jr., in Nebraska.

Since an occasional Western Wood Pewee wanders into our area, the following comments are directed toward those banders who would like to contribute toward a better understanding of the movements of this species. We are not recommending that eastern banders use this information as a means of enlarging their list of species banded. On the contrary, pewees should *not* be banded as *sordidulus* and then released. Though the identity of pewees may often be suspected, particularly if the individual is a young male, the distinctions are fine and the similarities great. Any pewee suspected of being a species unusual for your locality (such as *sordidulus* east of the 100th meridian) should be saved as a scientific specimen, carefully aged and sexed, and placed in a collection where it will be *available* for study at any time.

Adults of the two forms look exactly alike except in spring and early summer, during which time most Westerns are distinguishable under exceptionally favorable circumstances (such as direct comparison) by their slightly darker, browner colors. These are best seen on the chest and sides, and especially (in the hand) on the under side of the bend of the wing. The chest-band is broad and continuous, and both it and the back are often tinged with brown—never with olive (greenish) as in the Eastern. Either species may be "dead" grayish, however. Other minor tendencies to darkness in the Western are in the mandible (usually dark over at least the distal third) and the concealed centers of the feathers of the crissum (under tail-coverts). The Eastern is usually wholly pale here and on the lower mandible (except at its very tip); its gray chest-band tends to be narrower, sometimes even interrupted in the middle. Even in the hand, however, many individuals can only be named by comparison with identified skins. After July the task of identification becomes hopeless.

By July, young pewees begin to be common, and in the southernmost states the young are occasionally full-grown by late June. These birds are dark, particularly on the sides of the chest and the upper parts (crown, wings, tail). They are told from adults by the two definite wing-bars formed by the distinct, *sharply* contrasting tips to at least the greater (and usually middle) wing-coverts, which

usually show a buffy cast never found in adults; the dusky (at least distally) lower mandible; and the tertials, which (at least until October) are fresh, fully rounded at the tips, and broadly edged with whitish.

Immatures must not be compared with adults. When comparing immatures alone, the *relative* differences that distinguish the two forms are about the same as in spring adults. But oddly enough there are also helpful structural differences, as long as the bird's tail and its upper coverts are intact and unruffled. The first of these is a measurement which, for brevity, can be called "tail clear": the distance from the tip of the longest upper tail covert, in place and gently smoothed toward the rear to attain its maximum length, to the tip of the tail, when arranged for its normal maximum. In young *sordidulus*, regardless of sex, this "tail clear" seldom exceeds 32 millimeters; any young pewee with "tail clear" under 31.2 millimeters is probably *sordidulus*, particularly if the wing (chord) exceeds 81.7 millimeters. In young male *virens*, tail clear is usually 32.5 millimeters, or more, and any young pewee surpassing this figure is pretty surely *virens*. These males have the wing (chord) 79.5 millimeters or over. Young females (wing not over 81 millimeters) are more variable, many being under 32 millimeters; thus a smaller percentage is identifiable by this means.

A second useful character, applicable to *young males*, is the length of the central pair of tail-feathers (from their insertion into the skin). In *virens* these are 59.5 millimeters or longer, whereas in *sordidulus* we have seen no specimen exceeding 60 millimeters; thus, the males of the two species hardly overlap. But many young females of *virens* have central rectrices that are decidedly shorter.

Probably a 95 per cent separation of young males can be made by combining the last two characters, *i.e.* measuring the bare, uncovered dorsal part of the central rectrices. Young male *virens* examined have all been over 29 millimeters, whereas *sordidulus* rarely exceed 28 millimeters (the longest *sordidulus* was 29.8 mm.; the shortest *virens* was 29.5 mm.). Even in this measurement, young females overlap widely: most *sordidulus* measure 26.2 to 27 mm., but some *virens* equal these figures (though most of them exceed 27.0 mm.).

Color is also important in identifying young pewees. Juvenal-plumaged *virens* have the wing-bars warm buff to whitish; commonly both are similar in color, but if the anterior bar is noticeably darker than the posterior bar, the darkening is in the direction of a warm cinnamon-buff. In juvenal-plumaged *sordidulus* the anterior bar is usually decidedly darker and *duller* than the posterior bar, *i.e.* more suffused with a fulvous or grayish color such as is found on the bird's cheeks. In fact, the anterior bar is sometimes rather narrow and ill-defined except on the innermost middle coverts (less conspicuous than the sharply contrasting 1.0 to 1.5 mm. tips to most of the middle coverts in young *virens*).

HINTS FOR THE WEST

To be used west of the Mississippi River, *only*.

Eastern flycatchers, like most other eastern birds, occur west to

about the 100th meridian, beyond which they are generally rare. Even the extreme eastern parts of New Mexico, Colorado, Wyoming, and Montana have a predominance of western birds, well before the Rocky Mountains are reached. Eastern Wood Pewees, and Yellow-bellied and Acadian Flycatchers are hardly more than accidental there. Conversely, the bander near the 100th meridian should be alert (particularly toward the south) for western species: Western Wood Pewee, Cassin's Kingbird (*Tyrannus vociferans*), and Gray (*Empidonax wrightii*), Dusky (*E. oberholseri*), Hammond's (*E. hammondi*), and Western (*E. difficilis*) Flycatchers. Most of these are darker gray, and less whitish on the throat and chest than their eastern relatives. All western species of *Empidonax*, save most males and a few females of *hammondi*, have the tenth primary shorter than the fifth; all except *trillii* have the sixth primary cut out; and all except *difficilis* and *trillii* have the tail either definitely forked (not merely slightly notched) or bicolored, *i.e.* the outermost feather has a distinctly contrasting whitish outer web. Western species of *Empidonax* generally show a less contrasting wing-pattern; the tertials are less dusky, with their edgings and usually the wing-bars less abruptly whitish. As yet the only useful key to these western species is that mentioned earlier (Phillips, Marshall, and Monson, 1964).

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