

SPECIMEN EVIDENCE FOR THE OCCURRENCE OF BOTH GRAY-CHEEKED AND BICKNELL'S THRUSHES IN FLORIDA

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Abstract.—After determining how to distinguish the two species, we searched certain museum collections for study skins of Gray-cheeked and Bicknell's thrushes from Florida. We found many skins of the Gray-cheeked Thrush, but in the museums we checked, we found only four skins of Bicknell's Thrush. These four specimens were in two out-of-state museums and at Archbold Biological Station in Florida.

To date the bird species known to have occurred in Florida have been based on verifiable evidence (Robertson and Woolfenden 1992, FOS Records Committee, pers. comm.). Thus, for all species on the list, tangible evidence (e.g., specimen, photograph, sound recording) exists in an institution where it can be examined by anyone. Recently, the "gray-cheeked thrush" complex (*Catharus minimus* sensu AOU Checklist 1983 and earlier) was split into two species (AOU 1998), however only limited verifiable evidence for the occurrence of either species in Florida can be found in the literature. We examined study skins of the two species that constitute the gray-cheeked thrush complex that had been collected in Florida and are housed in institutions within and outside the state. Of special interest to us was whether or not any specimens of Bicknell's Thrush existed, and if so, whether any resided in collections in Florida.

METHODS

We borrowed Florida specimens of the gray-cheeked thrush complex from the National Museum of Natural History (USNM, 8), Field Museum of Natural History (FMNH, 9), University of Michigan Museum of Zoology (UMMZ, 2), Florida Museum of Natural history (UF, 12), and Tall Timbers Research Station (TTRS, 11). We also examined thrushes of this complex housed at Archbold Biological Station (GEW, 11). The specimens we examined are listed in Appendix 1. From the Museum of Comparative Zoology, we borrowed 10 specimens of Bicknell's Thrush collected on the breeding grounds.

Lowther et al. (2001) summarized the features used to distinguish the two species; these are based especially on work done by Phillips (1991), Pyle (1997), Lane and Jaramillo (2000), and Marshall (2001). Some of these authors mentioned color differences. Although perhaps useful for identifying living birds, we were unable to use bare part colors to identify dead specimens. We also found that plumage color varied too much to be useful. For example, we examined two specimens that had reddish remiges, a feature of Bicknell's Thrush, which from other characters seemed to be Gray-cheeked Thrushes.

Certain of the measurements Lowther et al. (2001) listed we found useful for identifying the two species. Other measurements were not useful. For example, based on comparing the measurements of the tail length of the 10 Bicknell's Thrushes collected on

the breeding grounds with published measurements used to distinguish the two species, we consider tail measurements useless for distinguishing them.

The measurements we found most useful were associated with the wing. These were wing chord, the ratio of primary extension to tertial extension, distance from the tip of primary 8 to the tip of primary 1, and distance from the tip of primary 8 to the tip of primary 6. The first measures folded wing-length (Bicknell's Thrushes are relatively short-winged), the second and third measure extension of the outer wing beyond the inner wing (Bicknell's Thrushes exhibit relatively short outer-wing extensions), and the fourth measures wing-tip shape (Bicknell's Thrushes have relatively rounded wings). The relatively long, attenuated, and pointed wings in the Gray-cheeked Thrush probably are associated with its longer migrations.

We examined the measurements from the standpoints of overall ranges and overlaps in both sexes combined, and of ranges and 95 percent confidence limits (Ouellet 1993) segregated by sex. Our determinations were based on congruence of our judgments from these different perspectives.

RESULTS

Appendix 1 lists the 54 specimens of the gray-cheeked thrush complex collected in Florida that we examined, and for each we list the wing measurements we used for species identification. We arranged these specimens in descending order of their wing chord measurement. Table 1 lists the four wing measurements we used and gives the ranges of these measurements for the two species as listed in Lowther et al. (2001), and for the Florida specimens we examined. We determined that 47 of the specimens were Gray-cheeked Thrushes and four were Bicknell's Thrushes, with three (TTRS 900, GEW 3738, FMNH 352174) left as undetermined because they were intermediate in measurements.

DISCUSSION

Where the Florida specimens were collected supports our identifications. The Gray-cheeked Thrush migrates throughout eastern and central North America east of the Rocky Mountains (map in Sibley

Table 1. Wing measurements (mm) of Gray-cheeked and Bicknell's thrushes. P_e/T_e refers to the ratio of primary extension to tertial extension (see footnote, Appendix 1).

Species/source	Wing chord	P8-P6 diff	P8-P1 diff	P_e/T_e
<i>C. minimus</i> ¹	93.0-109.0	5.0-10.0	27.0-35.0	0.84-1.33
<i>C. minimus</i> , FL only (Appendix 1)	94.0-106.0	6.0-10.5	26.0-35.0	0.94-1.61
<i>C. bicknelli</i> , FL only (Appendix 1)	89.5-93.0	4.5-7.0	23.0-25.5	0.92-1.00
<i>C. bicknelli</i> ¹	80.0-100.0	3.0-7.0	24.0-29.0	0.64-1.10

¹Difference (diff) ranges are from Lowther et al. 2001; ratio values (ranges) are from Lane and Jaramillo 2000.

2001) and winters in northern South America east of the Andes. Apparently most individuals migrate through Mexico or over the Gulf of Mexico. In Florida gray-cheeked thrushes of either species are rare in the interior of the peninsula (Robertson and Woolfenden 1992). Most of the 47 Florida Gray-cheeked Thrush specimens came from counties in the northern peninsula or panhandle. Sixteen were collected at a TV tower in Leon County, which lies in the eastern panhandle (Crawford 1981). Only 11 specimens were from counties along the Atlantic coast (Volusia, Dade, Monroe). Some of these 11 specimens, especially those from Monroe County, could have been Gulf migrants blown off-course to the east. During spring migration many North American breeding birds that winter in South and Middle America land on the Dry Tortugas during inclement weather, namely frontal storms that come through Florida from the north and west. All four specimens collected at the Dry Tortugas during spring were identified as Gray-cheeked Thrushes.

Bicknell's Thrushes migrate through eastern North America east of the Appalachians and winter in the Greater Antilles (map in Sibley 2001). During fall migration Bicknell's Thrushes are said to depart North America from the mid-Atlantic states and the Carolinas and fly over the ocean to the Greater Antilles. During spring migration, Bicknell's Thrushes apparently appear regularly in southeastern United States including Florida (Rimmer 2001). All four Florida specimens, three collected in spring, one in fall, came from counties along the Atlantic coast (Nassau, Brevard, Dade).

Almost all members of the gray-cheeked thrush complex that migrate through Florida pass through during April-May and September-October (Stevenson and Anderson 1994). If any differences in migration dates between the two species exist, we have not found them. All the spring specimens of both species that we examined occurred during the two months mentioned. With the exception of one Bicknell's Thrush, all the fall specimens occurred within the two months mentioned. The one exception is the Bicknell's Thrush collected 5 November in Dade County, which lies at the southeastern tip of the peninsula. The possibility exists that this individual continued moving south along a mainland route into Florida, or that it was displaced by easterly winds from an offshore route over the Atlantic Ocean in the region of the Bahama Islands.

We make no comment on the validity of Bicknell's Thrush as a species separate from the Gray-cheeked Thrush. Our results, if valid, hold even if the two populations are considered subspecies of one species.

The taxonomic history of these two distinct members of the gray-cheeked thrush complex began in the late 1800s. Discovered in 1881, Bicknell's Thrush was described and classified as a subspecies of the Gray-cheeked Thrush (*Catharus minimus*) by Ridgway (1882), and it

remained as a subspecies until 1998 when it was deemed by the checklist committee of the American Ornithologists' Union to be a separate species (AOU 1998). The decision was based especially on work by Henri Ouellet (1993). The Gray-cheeked Thrush (*C. minimus, sensu stricto*) breeds in stunted boreal coniferous forest and tall taiga scrub across all of Canada, Alaska (map in Lowther et al. 2001), and into eastern Siberia. Bicknell's Thrush (*C. bicknelli*) has a restricted range. It breeds in dense taiga undergrowth in southeastern Quebec and portions of the Maritime Provinces and discontinuously in the mountains of New England south to southern New York (map in Rimmer et al. 2001; Lambert et al. 2005).

Wallace (1939), who was one of the first to study this complex, listed two specimens of Bicknell's Thrush from Florida, one from Eau Gallie, Brevard County, housed at the University of Michigan (UMMZ 43531), and one from Nassau County, housed at the Field Museum of Natural History (FMNH 70076). We examined both of these specimens and agree with Wallace's determinations. These two specimens are the first records of Bicknell's Thrush from Florida. Phillips (1991), who apparently tentatively considered Bicknell's Thrush to be a separate species—he listed it as “(?)*Catharus bicknelli*”—mentioned a specimen from St. George Is, Franklin County, in the collection at TTRS, but he gave no museum number, and Bent (1949) mentioned a specimen of Bicknell's Thrush from the north Floridian coast taken 3 May, but he provided no further data.

Recently Brand et al. (in press) reported on two Bicknell's Thrushes netted in the Florida Keys. These individuals, captured on Key Largo, were photographed, measured, banded and released. Bird #1, netted 8 May 2002, had the following wing measurements (mm): wing chord 91; p8-p6, 4; p8-p1, 24. Bird #2, netted 11 May 2002, had the following wing measurements: wing chord, 93.5 (each wing); p8-p6, 1; p8-p1, 26.2. Evans (1994) distinguished the two species in the gray-cheeked thrush complex by nocturnal flight calls. On 6 May 1989 and 13-16 May 1991 along the Atlantic coast in Brevard County, Florida, Evans recorded calls that he decided were made by Bicknell's Thrushes. If correct, these two reports support the opinion that Bicknell's Thrushes move along the east coast of Florida during spring migration.

Lee (1995) examined specimens of the gray-cheeked thrush complex from North Carolina and had results similar to ours. He found 23 Gray-cheeked Thrushes and one Bicknell's Thrush (USNM 357650). McNair and Post (1993) identified two specimens of Bicknell's Thrushes from South Carolina. We know of no investigation that documents the occurrence of gray-cheeked thrushes in Georgia.

Based on the extent of the breeding ranges of the two species, the Gray-cheeked Thrush must be a far more abundant bird than Bick-

nell's Thrush. This suggests that the Gray-cheeked Thrush should outnumber Bicknell's Thrush in Florida as well.

In conclusion, specimens exist to confirm the occurrence of both the Gray-cheeked Thrush and Bicknell's Thrush in Florida. The Gray-cheeked Thrush is recorded by numerous specimens, including some in museums in Florida (Florida Museum of Natural history, Tall Timbers Research Station, Archbold Biological Station). Bicknell's Thrush, in contrast, is represented by only four Florida specimens, two housed out-of-state at the Field Museum of Natural History in Chicago (FMNH 70076) and at the University of Michigan Museum of Zoology (UMMZ 43531) in Ann Arbor. These are referred to in Wallace's (1939) classic work of more than half a century ago. The other two are housed at Archbold Biological Station (GEW 6000 and GEW 6002).

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LITERATURE CITED

- AOU. 1983. Check-list of North American birds, 6th ed. American Ornithologists' Union, Washington, D.C.
- AOU. 1998. Check-list of North American birds, 7th ed. American Ornithologists' Union, Washington, D.C.
- BENT, A. C. 1949. Life histories of North American thrushes, kinglets, and their allies. U.S. National Museum Bulletin 196.
- BRAND, S., C. A. LOTT, AND M. B. MULROONEY. 2005. Two Bicknell's Thrushes banded during spring migration on Key Largo: First accepted records for Florida. *Florida Field Naturalist* 33: 102-104.
- CRAWFORD, R. L. 1981. Bird casualties at a Leon County, Florida TV tower: a 25-year migration study. *Bulletin of the Tall Timbers Research Station* no. 22:1-28.
- EVANS, W. R. 1994. Nocturnal flight call of Bicknell's Thrush. *Wilson Bulletin* 106:55-61.
- LAMBERT, J. D., K. P. MCFARLAND, C. C. RIMMER, S. D. FACCIO, AND J. L. ATWOOD. 2005. A practical model of Bicknell's Thrush distribution in the northeastern United States. *Wilson Bulletin* 117:1-11 (plus color frontis).
- LANE, D., AND A. JARAMILLO. 2000. Identification of *Hylocichla/Catharus* thrushes. Pt. III: Gray-cheeked and Bicknell's thrushes. *Birding* 32:318-331.
- LEE, D. S. 1995. Status and seasonal distribution of Bicknell's and Gray-cheeked thrushes in North Carolina. *Chat* 59:1-8.
- LOWTHER, P. E., C. C. RIMMER, B. KESSELL, S. L. JOHNSON, AND W. G. ELLISON. 2001. Gray-cheeked Thrush (*Catharus minimus*). In *The birds of North America*, No. 159 (A. Poole and F. Gill, Eds.). The Birds of North America, Inc., Philadelphia, PA.
- MARSHALL, J. T. 2001. The Gray-cheeked Thrush, *Catharus minimus*, and its New England subspecies, Bicknell's Thrush, *Catharus minimus bicknelli*. *Publications of the Nuttall Ornithological Club*, no. 28.

- MCLAREN, I. A. 1995. Field identification and taxonomy of Bicknell's Thrush. *Birding* 27:358-366.
- MCLAIR, D. B., AND W. POST. 1993. Supplement to the status and distribution of South Carolina birds. Charleston Museum Ornithological Contribution no. 8. 49 pp.
- OUELLET, H. 1993. Bicknell's Thrush: taxonomic status and distribution. *Wilson Bulletin* 105:545-572.
- PYLE, P. 1997. Identification guide to North American birds. Pt. 1: Columbidae to Ploceidae. Slate Creek Press, Bolinas, CA.
- RIDGWAY, R. 1882. Descriptions of two new thrushes from the United States. *Proceedings of the U.S. National Museum* 4:377-378.
- RIMMER, C. C., K. P. MCFARLAND, W. G. ELLISON, AND J. E. GOETZ. 2001. Bicknell's Thrush (*Catharus bicknelli*). In *The birds of North America*, No. 592 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- ROBERTSON, W. B., JR., AND G. E. WOOLFENDEN. 1992. Florida bird species. Florida Ornithological Society Special Publication no. 6, 260 pp.
- STEVENSON, H. S., AND B. H. ANDERSON. 1994. *The birdlife of Florida*. University Press of Florida, Gainesville.
- WALLACE, G. J. 1939. Bicknell's Thrush, its taxonomy, distribution, and life history. *Proceedings of the Boston Society of Natural History* 41:211-402.

Appendix 1. Collecting data, measurements and determinations for 54 specimens of Gray-cheeked and Bicknell's thrushes collected in Florida.

Museum No.	Location	Date	Age	Sex	Wing	Measurements			Determinations ¹			
						Primary extension	Tertial extension	Pe/Te ²	P8-P6 ³	P8-P1 ⁴	Species ID	Wing ra/95%
TTRS 971	Leon	06 May 1957	ad	m	106.0	32.0	20.0	1.60	9.5	33.5	<i>minimus</i>	m/m
GEW 3735	Monroe	26 Apr 1968	ad	m	105.5	33.0	31.0	1.10	9.0	28.0	<i>minimus</i>	m/m
FMNH 18065	Alachua	26 Apr 1987	ad	m	105.0	33.0	21.0	1.57	8.5	30.0	<i>minimus</i>	m/m
FMNH 352172	Pinellas	04 May 1964	ad	m	104.0	32.0	27.0	1.19	7.0	29.5	<i>minimus</i>	m/m
TTRS 3595	Franklin	20 Apr 1978	ad	m	103.5	33.0	23.0	1.43	9.0	28.0	<i>minimus</i>	m/m
GEW 5957	Monroe	17 Apr 1956	ad	m	103.0	30.0	24.0	1.20	8.0	33.0	<i>minimus</i>	m/m
TTRS 905	Franklin	24 Apr 1958	ad	m	103.0	29.0	21.5	1.35	9.5	31.0	<i>minimus</i>	m/m
UF 10676	Leon	2 May 1964	ad	f	103.0	33.0	25.5	1.29	9.0	32.5	<i>minimus</i>	m/m
USNM 298912	Jefferson	12 May 1926	ad	m	102.5	35.5	33.0	1.08	9.0	34.0	<i>minimus</i>	m/m
UF 10675	Leon	02 May 1964	ad	m	102.5	32.0	27.0	1.19	10.0	31.5	<i>minimus</i>	m/m
TTRS 901	Leon	29 Apr 1964	im	m	102.5	31.0	22.0	1.41	10.5	32.0	<i>minimus</i>	m/m
GEW 5998	Dade	27 Sep 1971	hy	m	102.0	32.5	27.0	1.20	8.5	33.0	<i>minimus</i>	m/m
UF 20655	Alachua	21 Oct 1980	hy	m	102.0	38.0	28.0	1.36	9.5	35.0	<i>minimus</i>	m/m
FMNH 352170	Pinellas	05 May 1964	im	m	102.0	29.0	31.0	0.94	8.0	28.0	<i>minimus</i>	m/m
UMMZ 59174	Pinellas	24 Apr 1928	ad	m	101.5	39.0	25.0	1.56	9.0	31.0	<i>minimus</i>	m/m
UF 19252	Alachua	10 May 1974	ad	m	101.0	32.0	24.0	1.33	9.0	30.0	<i>minimus</i>	m/m
UF 10673	Leon	02 May 1964	ad	m	101.0	31.0	24.0	1.29	9.0	30.0	<i>minimus</i>	m/m
UF 3071	Leon	26 Oct 1957	ad	f	101.0	27.0	28.0	0.96	8.0	29.5	<i>minimus</i>	m/m

¹Left column: Species identification (ID) based on congruent indications of wing chord, ratio of primary extension to tertial extension, P8-P6, and P8-P1 (see below) using overall measurement ranges and overlaps without regard to sex. Right column: Species identification (ID) (b = *bicknelli*, m = *minimus*) based on wing chord ranges (ra) and overlaps (o), and on 95% confidence limits, in the pertinent sex (Ouellet 1993).

²Ratio of primary extension (distance from end of longest tertial or exposed secondary to tip of longest primary) to tertial extension (distance from overlying coverts to tip of longest tertial).

³Difference (mm) between primary (P) 8 and primary 6, tip to tip.

⁴Difference (mm) between primary 8 and primary 1, tip to tip.

⁵Tip of primary 6 broken; value estimated from extrapolated tip position.

Appendix 1. (Continued) Collecting data, measurements and determinations for 54 specimens of Gray-cheeked and Bicknell's thrushes collected in Florida.

Museum No.	Location	Date	Age	Sex	Wing	Measurements				Determinations ¹	
						Primary extension	Tertial extension	Pe/Te ²	P8-P6 ³	P8-P1 ⁴	Species ID
USNM 523060	Monroe	14 May 1922	ad	f	100.0	27.5	26.5	1.04	7.0	27.0	m/m
TTRS 902	Leon	05 May 1957	ad	f	100.0	28.0	21.0	1.33	9.0	29.0	m/m
UF 9486	Leon	02 Oct 1962	hy	m	99.5	29.0	25.0	1.16	8.0	29.5	m/m
GEW 5956	Monroe	27 Apr 1972	ad	m	99.5	32.0	27.0	1.20	8.0	30.0	<i>minimus</i>
UF 10246	Leon	02 Oct 1962	ad	m	99.0	29.0	25.0	1.16	7.0	29.0	m/m
FMNH 352171	Hillsborough	early Oct 1966	ad	m	99.0	33.0	22.0	1.50	8.0	30.0	<i>minimus</i>
USNM 523061	Monroe	17 May 1922	ad	f	99.0	27.0	23.0	1.17	7.0	33.0	m/m
GEW 3739	Monroe	05 May 1968	ad	f	99.0	34.0	25.0	1.20	8.0	30.0	m/m
UF 21863	Alachua	20 Oct 1986	hy	m	98.5	28.5	21.0	1.36	8.5	29.0	o/m
USNM 341778	Volusia	16 Oct 1935	ad	u	98.0	27.0	24.5	1.10	8.0	27.5	o/m
GEW 5955	Highlands	08 Oct 1968	hy	u	98.0	29.0	25.5	1.13	6.0	28.0	o/m
USNM 466180	Leon	1 May 1957	im	f	98.0	28.0	21.0	1.33	9.0	30.0	<i>minimus</i>
GEW 5999	Dade	16 May 1957	ad	f	98.0	28.0	28.0	1.00	7.0	34.0	o/m
TTRS 899	Leon	09 Oct 1955	ad	f	98.0	29.0	18.0	1.61	10.0	31.0	<i>minimus</i>
TTRS 898	Leon	11 May 1958	ad	f	98.0	29.0	18.0	1.61	8.0	28.0	o/m
USNM 523059	Monroe	17 May 1922	ad	f	97.5	28.0	26.0	1.08	8.0	27.0	o/m
USNM 466181	Leon	09 Oct 1955	hy	f	97.5	27.0	26.0	1.04	8.5	26.5	o/m
UF 11079	Gilcrest	06 Oct 1965	hy	f	97.0	29.0	27.5	1.05	7.5	31.0	o/o

¹Left column: Species identification (ID) based on congruent indications of wing chord, ratio of primary extension to tertial extension, P8-P6, and P8-P1 (see below) using overall measurement ranges and overlaps without regard to sex. Right column: Species identification (ID) (b = *bicknelli*, m = *minimus*) based on wing chord ranges (ra) and overlaps (o), and on 95% confidence limits, in the pertinent sex (Ouellet 1993).
²Ratio of primary extension (distance from end of longest tertial or exposed secondary to tip of longest primary) to tertial extension (distance from overlying coverts to tip of longest tertial).

³Difference (mm) between primary (P) 8 and primary 6, tip to tip.

⁴Difference (mm) between primary 8 and primary 1, tip to tip.

⁵Tip of primary 6 broken; value estimated from extrapolated tip position.

Appendix 1. (Continued) Collecting data, measurements and determinations for 54 specimens of Gray-cheeked and Bicknell's thrushes collected in Florida.

Museum No.	Location	Date	Age	Sex	Wing	Measurements			Determinations ¹			
						Primary extension	Tertial extension	Pe/Te ²	P8-P6 ³	P8-P1 ⁴	Species ID	Wing ra/95%
FMNH 398663	panhandle	04 May-98	hy	f	97.0	28.0	23.0	1.22	9.0	30.5	<i>minimus</i>	o/o
FMNH 18062	Monroe	25 Apr 1891	hy	f	96.5	30.0	24.0	1.25	8.0	27.0		o/o
UF 40815	Levy	14 May 1999	hy	f	96.0	36.5	26.0	1.40	9.5	28.0		o/o
TTRS 3480	Leon	24 May 1976	ad	f	96.0	27.0	24.5	1.10	8.0	29.0		o/o
USNM 523058	Monroe	14 May 1922	ad	f	95.5	31.0	25.5	1.22	8.0	27.0		o/o
GEW 6001	Dade	18 Oct 1959	ad	f	95.5	29.0	26.5	1.02	8.0	30.0		o/o
TTRS 903	Leon	07 Oct 1965	hy	f	95.5	27.0	19.0	1.42	9.0	28.0		o/o
FMNH 352173	Monroe	05 May 1968	im	f	95.5	28.0	28.0	1.00	8.0	26.0		o/o
UF 10670	Leon	02 May 1964	ad	u	95.0	29.0	26.0	1.12	8.5	28.0		o/o
TTRS 897	Leon	24 Apr 1958	im	f	95.0	28.0	20.0	1.40	9.0	29.0		o/o
UF 39665	Alachua	21 Oct 1995	ad	f	94.5	33.5	22.0	1.52	7.5	32.0		o/o
TTRS 900	Leon	09 Oct 1956	hy	f	94.0	27.0	27.0	1.00	7.5	26.5	<i>bicknelli?</i>	o/o
GEW 3738	Monroe	05 May 1968	ad	f	94.0	29.0	29.0	1.00	5.0	25.0	<i>bicknelli?</i>	o/o
FMNH 352174	Indian River	19 Nov 1971	im	f	94.0	38.0	26.5	1.43	8.0	26.5		o/o
FMNH 70076	Nassau	08 May 1916	im	m	93.0	28.0	28.0	1.00	7.0	24.5	<i>bicknelli</i>	b/b
UMMZ 43531	Brevard	03 May 1910	ad	m	91.0	28.5	30.0	0.95	~5.0 ⁵	23.0	<i>bicknelli</i>	b/b
GEW 6000	Dade	14 May 1960	ad	m	90.5	27.0	26.0	1.00	4.5	25.5	<i>bicknelli</i>	b/b
GEW 6002	Dade	05 Nov 1956	hy	m	89.5	24.0	26.0	0.92	5.0	22.5	<i>bicknelli</i>	b/b

¹Left column: Species identification (ID) based on congruent indications of wing chord, ratio of primary extension to tertial extension, P8-P6, and P8-P1 (see below) using overall measurement ranges and overlaps without regard to sex. Right column: Species identification (ID) (b = *bicknelli*, m = *minimus*) based on wing chord ranges (ra) and overlaps (o), and on 95% confidence limits, in the pertinent sex (Ouellet 1993).

²Ratio of primary extension (distance from end of longest tertial or exposed secondary to tip of longest primary) to tertial extension (distance from overlying coverts to tip of longest tertial).

³Difference (mm) between primary (P) 8 and primary 6, tip to tip.

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⁵Tip of primary 6 broken; value estimated from extrapolated tip position.