

2005

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Colwell, Rita R. (2005) "Description of the Second Rectrix of Adult-plumaged Male Rufous and Allens Hummingbirds and Its Usefulness in Identification," *North American Bird Bander*. Vol. 30 : Iss. 1 , Article 3. Available at: <https://digitalcommons.usf.edu/nabb/vol30/iss1/3>

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Description of the Second Rectrix of Adult-plumaged Male Rufous and Allen's Hummingbirds and Its Usefulness in Identification

Rita R. Colwell
281 Margarita Court
Los Altos, CA 94022
rcolwell@sbcglobal.net

ABSTRACT

Differences in the shape of the second rectrix in Rufous Hummingbirds (*Selasphorus rufus*) and Allen's Hummingbirds (*S. sasin*) are significant distinguishing characters. Although many references describe the feather as "notched" in Rufous Hummingbird, a detailed description of this feather's appearance in the adult male is lacking. My study describes the typical notching of the inner web and emargination of the outer web of the second rectrix of the adult-plumaged male Rufous Hummingbird that is lacking in the adult male Allen's Hummingbird. I examined 135 birds, of which 62 had characteristics typical of Rufous Hummingbird, and 70 which showed characteristics of Allen's Hummingbird. This rectrix in three birds had abnormal features and the individuals had inconsistent measurements that may indicate hybridization.

INTRODUCTION

In-hand separation of adult male Rufous Hummingbirds (*Selasphorus rufus*) from Allen's Hummingbirds (*S. sasin*) is accomplished by using a combination of plumage appearance and rectrix measurements (Pyle 1997, Mitchell 2000, Stiles 1972). Notching of the second rectrix (R2) has been stated as an important identification characteristic of Rufous Hummingbirds, and the lack of notching on R2 indicates an Allen's Hummingbird (Stiles 1972, Pyle 1997, Mitchell 2000, Williamson 2001, Howell 2002). These accounts, however, vary greatly and most do not describe adequately the appearance of the feather.

Stiles (1972) states that the "tip of second rectrix [is] deeply emarginated." Pyle (1997) maintains

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adult males' R2 is "distinctly notched." But his illustration shows the variation in notching for females and juvenile males. An added note to the illustration states that "adult males have a greater notch than is shown." Johnsgard (1997) describes the feather only as "strongly notched in males." In Williamson's (2001) species account, she states that adult male Rufous Hummingbirds have "R2 distinctly notched on inner web near tip" and provides a photograph showing a strong notch on the inner web and an additional emargination on the outer web. Howell (2002) writes that in the adult males "a strongly emarginated notch on the outer web of R2 is diagnostic." However, the plate reference shows an adult male Rufous Hummingbird with a strong notch on the opposite web than stated.

These disparate descriptions create confusion over what is normal and what is abnormal in the feather's structure. The purposes of this paper are to clarify the typical R2 appearance in adult male Rufous and Allen's hummingbirds, describe three abnormal individuals, and present the hypothesis that these birds were interspecific hybrids.

METHODS

I examined mist-netted adult-plumaged male Rufous and Allen's hummingbirds at a site 10 miles northeast of San Jose, California, and at the Arboretum of the University of California, Santa Cruz, California. Museum specimens were examined at the California Academy of Science (CAS), San Francisco, California; at the Museum of Vertebrate Zoology (MVZ), Berkeley, California; and at the University of Alaska, Fairbanks, Alaska (UAF). Live birds were examined during February,

March, and April and all of the museum specimens examined were collected during February through July. Because of the area where mist-netting occurred and the collecting sites for specimens, all Allen's Hummingbirds encountered were assumed to be the nominate race *S. s. sasin*. Measurements taken were wing chord and width of rectrix 5 (R5). These features were measured according to Baltosser (1987). R2 notch and emargination were taken on individuals with measurable dimensions. The wing chord measurement was taken using a thin plastic rule. R5 width and R2 notch dimensions were measured to the nearest 0.1 mm using a digital caliper.

Notching on the inner web of R2 was measured by quantifying the distance of the notch from the feather tip and the depth of notch from the margin. The emargination on the outer web was measured in a similar manner (Figure 1). For all birds, feather tip wear was negligible.

I included an estimate of the amount of green present dorsally on all individuals of both species that I examined. The area used for the estimate is described in Aldrich (1956) as the "dorsal region" and extends from the posterior margin of the nape to the upper tail coverts, shoulder to shoulder (wing bases) on the upper back, and laterally on the lower back sides down to the abdominal tract region.

RESULTS

The sample size of adult-plumaged males was 135. Sixty-two birds were classified as Rufous Hummingbird on the basis of wing chord range given by Stiles (1972) and R5 width measurements in range given by Pyle (1997) for adult males (Table 1). R2 patterns of these birds showed a strong notch on the inner web and a distinct emargination on the outer web (Figure 2A). The measurements of the notch and emargination for these 62 birds are shown in Table 2.

Seventy birds identified as Allen's Hummingbirds showed no notching or emargination on either web of R2 (Figure 2B). These birds had wing chord range given by Stiles (1972) and R5 width measurements in range given by Pyle (1997) for adult males (Table 1).

Table 3 shows measurements and characteristics of three birds demonstrating inconsistencies which prevented their identification as to species. One was a mist-netted bird and the other two were specimens at CAS. The live bird, band number 3000-07475 (Figure 3A), and specimen CAS 46047 (Figure 3B) had notching on R2, but in both cases the inner web notch and the outer web emargination were not so strong and distinct as those found on typical Rufous Hummingbirds and the R5 width was in range of Allen's Hummingbirds.

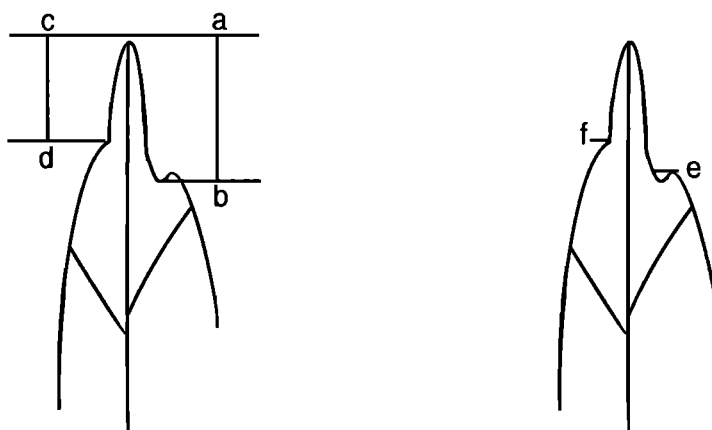


Figure 1. Dimensions of notch and emargination on second rectrix of an adult male Rufous Hummingbird. The inner web of the feather is on the right. The distance of the notch from the tip on the inner web is (ab); the distance of emargination on the outer web is (cd). The depth of the notch on the inner web is (e) and the depth of emargination on the outer web is (f).

Table 1.

Measurements of adult male Rufous and Allen's hummingbirds with typical R2.

	This study		Reference	
	Mean	SD	Mean	SD
Wing (mm)				
Rufous	40.88	0.88	40.32 (Stiles)	0.87
Allen's	38.33	0.99	38.08 (Stiles)	0.84
R5 width (mm)				
Rufous	2.39	0.18		
Range	2.0 - 2.7 (62)		1.8 - 2.6 (Pyle)	
Allen's	1.44	0.22		
Range	0.9 - 1.9 (70)		1.2 - 1.9 (Pyle)	

Table 2.

Adult male Rufous Hummingbird R2 notch and emargination measurements (mm) for 62 individuals designated as typical.

	Inner web		Outer web	
	Down from tip	In from margin (depth)	Down from tip	In from margin (depth)
Range	4.0 - 6.0	0.6 - 2.0	3.0 - 4.7	0.2 - 0.9
Mean	4.98	1.27	3.75	0.57
SD	0.46	0.32	0.39	0.16

Table 3.

Three hummingbirds with inconsistent measurements and atypical appearing R2.

	3000-07475	CAS 46047	CAS 75817
Wing chord (mm)	38	40	40
possible species	Allen's or Rufous	Rufous	Rufous
Width R5 (mm)	1.6	1.6	2.1
possible species	Allen's	Allen's	Rufous
R2 appearance	atypical notching	atypical notching	sl. concave margins
% Green back	100	80	95

Specimen CAS 46047 had been identified originally as Rufous Hummingbird, but later L.C. Baptista added the comment that it was possibly a *S. rufus* x *S. sasin* hybrid. The third bird, specimen CAS 75817 (Figure 3C), labeled *S. sasin*, had wider appearing rectrices than other Allen's Hummingbird. Rectrix 2 appeared blunt-tipped rather than slimming to a sharp point as is typical for Allen's Hummingbird and was not notched. Both webs of the feather had a slight atypical concavity to the margins close to the tip. Significantly, the measured R5 width was within range of Rufous Hummingbird.

Measurements of the R2 notch and emargination of the 62 typical Rufous Hummingbirds (Table 2) show that the inner web notch is strong and deep, and its distance from the tip of the feather is usually greater than the emargination on the outer web. The less distinct emargination on the outer web of birds classified as Rufous Hummingbird was slighter, placed closer to the tip, and not as deep as the strong notch on the inner web. The emargination on the outer web was present on all birds classified as typical Rufous Hummingbirds. All typical Allen's Hummingbirds showed no notching or emargination on either web of the second rectrix.

The individuals determined to be typical for each of the species demonstrated no overlap in the R5 width. In the McKenzie and Robbins (1999)

study, this measurement showed no overlap either, which supports this feature as a reliable character for separating the species.

The 62 Rufous Hummingbirds determined as typical showed a wide range of green on the back. Seventeen birds had totally rufous backs; 40 had 1-50% green; four had 51-75% green; none had 76-94% green and one had 95-100% green. McKenzie and Robbins (1999), in a sample of 125 birds, had results showing six birds with backs 50-74% green; five with backs of 75-94% green; and five with backs 95-100% green, three of these birds in this range were considered possible hybrid *S. rufus* x *S. sasin*.

My sample of 70 Allen's Hummingbirds had backs ranging from 80 to 100%, a percent lower than McKenzie and Robbins (1999). The difference between my findings and theirs may be due to the particular area of the back I used to estimate coloration. My estimate area included the sides of the lower back which is the area where the rufous feathering, if present, was consistently found. In the Rufous Hummingbirds I examined, if the bird or specimen had significant amount of green feathering (>50%), it was concentrated on the upper and mid-back area with the rufous feathering appearing on the upper rump and lower back sides. This pattern was similar in Allen's Hummingbirds when they showed green feathering of less than 100%.

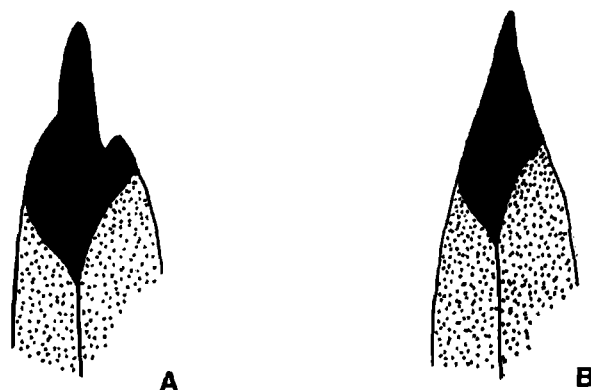


Figure 2. The second rectrix of (A) a typical adult male Rufous Hummingbird and (B) a typical adult male Allen's Hummingbird. The inner webs of the feathers are on the right for both illustrations.

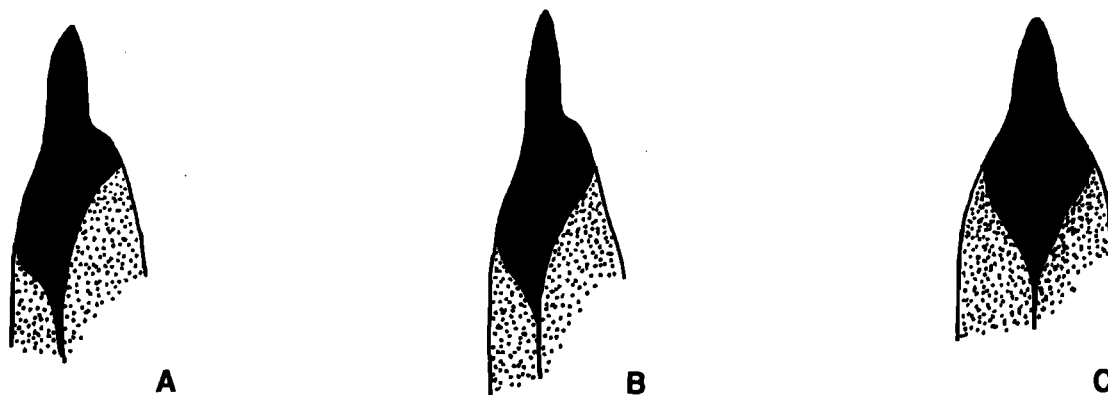


Figure 3. Three unusual second rectrices showing abnormal notching and emargination. The inner webs of the feathers are on the right for all illustrations. A, 3000-07475. B, CAS46047. C, CAS75817.

DISCUSSION

The appearance of the second rectrix in the adult male Rufous and Allen's hummingbird can serve as a distinguishing identification feature. The notching and emargination pattern found on R2 of all adult male Rufous Hummingbirds should have typical, measurable dimensions with the outer web showing a distinct emargination and the inner web a dramatic notch. Three birds encountered in this study showed atypical looking R2s. Two individuals' measurements could allow for speciation, #3000-07475 and specimen CAS 46017, but the appearance of their R2s did not match the measurements. The third individual, CAS 46047, had conflicting measurements not allowing speciation. Table 3 shows the comparisons. The reason for this variability is uncertain but may indicate hybrid individuals.

That hummingbirds hybridize has been supported by numerous examples (Banks and Johnson 1961, Williamson 1957, Lynch and Ames 1970, Heindel and Howell 2000). Hybridization between Rufous and Allen's hummingbirds has been suggested in the past (Newfield 1983; McKenzie and Robbins 1999), but has not been confirmed (Pyle 1997). Newfield (1983) examined specimens of an adult-plumaged male, an immature female, and a juvenile male which she described as unusual. The adult-plumaged male showed measurements within the range of Allen's Hummingbird, but had a "strongly emarginated" second rectrix. McKenzie and Robbins (1999) describe five specimens of adult-plumaged males with mixed measurements of

Allen's and Rufous hummingbirds. The authors provide comments about the shape of R2 on two of these specimens. One had the tip "slightly emarginated" and the other specimen they found had been annotated as "an Allen's Hummingbird with an anomalously emarginated R2." Though McKenzie and Robbins (1999) furnish a photograph showing the tails of typical adult male Allen's and Rufous hummingbird, they do not provide a comprehensive comparison of the typical and the atypical R2s they found.

Because Rufous and Allen's hummingbirds exhibit a narrow region of overlap in their breeding ranges (Grinnell and Miller 1944; Gilligan et al. 1994), they are likely candidates for hybridization. While other known hummingbird hybrids show unusual physical appearances in their plumage that are unlike either parent (Williamson 2001, Howell 2002, Heindel and Howell 2000, Williamson 1957, Banks and Johnson 1961), hybrids between Rufous and Allen's hummingbirds might not be recognized as such because the two species are so similar in appearance. The distinct R2 pattern of the adult-plumaged male Rufous Hummingbird is a physical characteristic which, *if affected*, might identify the individuals as hybrids.

In the adult-plumaged males of these two species, a combination of a typical appearing R2 for that species and measurements, especially the width of R5, is the most effective way of distinguishing these two hummingbirds species. When atypical or anomalous, those criteria may also serve to identify hybrids of Rufous and Allen's hummingbirds.

ACKNOWLEDGMENTS

I am grateful to the following individuals for their assistance during banding: Joyce Bartlett, Gina Barton, Irene Beardsley, Barbara Carlson, Maryann Danielson, Sherry Hudson, Kay Loughman, and Ruth Yoder. Examination of museum specimens was facilitated by Douglas Long (CAS), Carla Cicero (MVZ), and Dan Gibson (UAF). Mr. and Mrs. John C. Fell generously allowed access to their property for banding. Daniel Harder and the staff of the University of California, Santa Cruz Arboretum granted permission to band hummingbirds at this site. Barbara A. Carlson, Rosalie Lefkowitz, David L. Pearson, Stephen M. Russell, George West, and Susan M. Wethington critiqued earlier drafts of this paper. I am appreciative of Bill Loughman's editorial perspective in preparing the current version of this paper.

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♀ Rufous Hummingbird (gray scale) by George West