PRIMARY MOLT PROGRESSION OF A RUFOUS HUMMINGBIRD WINTERING ON THE TEXAS GULF COAST: NOVEMBER 2020 – MARCH 2021

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INTRODUCTION

In recent decades Rufous hummingbirds have become increasingly common overwintering birds in the Gulf Coast and SE United States, (Conway and Drennan, 1979, Hill, Sargent and Sargent, 1998). In the Texas Gulf Coast / Houston area they are commonly noted on eBird™ each winter. This short report concerns the winter molt sequence observed in one Rufous hummingbird overwintering the 2020-2021 season in the west Houston suburb of Katy Texas.

The Rufous in question first became a regular visitor in November 2020 where it stayed mostly near flowering Turk's caps and spent just as much time browsing them and Lantanas as it did at the feeders. By mid-January the Lantana was no longer flowering and since the hard freeze in February 2021 there were no flowers left in the garden, hummingbirds became entirely dependent on feeders. As the bird had some small amount of rufous on its otherwise green back I assumed it must be Rufous. McKenzie and Robbins, 1999, state that Allen's invariably have all-green backs. On 9 December I managed to photograph the bird with its tail spread and confirmed the presence of a relatively wide R5 confirming the Rufous ID.

The studied bird was readily recognizable from the start by its throat pattern and by its evident distain for using feeder perches and also by its very aggressive behavior. It did not just chase other hummingbirds, it chased small/medium birds as well. At one point it attacked / strafed / hassled a couple Chipping sparrows, driving them off in pursuit before returning to their feeder tray to buzz more Chipping sparrows. Chickadees and wrens were not spared and it also went after a Hermit thrush driving it into the tangle of Turk's caps and eventually over the fence and out of the garden.

For the most part the Rufous did not land on feeders but rather hovered over them to feed, occasionally steading itself with it feet on the top of the feeder but still hovering. This behavior facilitated the photographic capture of the wing detail.

Molt became apparent when the first P1 drop was observed on 22 November, 2020. Primary feather molt proceeded from then until March, 2021. Changes in the body feathers on the birds' back started in earnest around 8 - 10 January 2021 at about the time of P6 drop and continued over a one-month period. The presence of this overwintering bird provided an important opportunity to observe and document the winter molt of a Rufous hummingbird on the Gulf Coast. Additionally, an Allen's hummingbird visited the same garden in December 2021 to January 2022 and its stage of primary molt can be seen to be about six weeks in advance of the Rufous.

Finally, south Texas experienced a hard freeze over five days in mid-February 2021. I had to take the feeders inside each night and during the days I had to thaw them in a warm water bath

every half hour all day to keep the nectar liquid. It worked and the hummingbirds survived the freeze.

METHODS

Prior hummingbird migration and molt studies generally rely on the evaluation of bird skins or specimens housed in collections or by banding (Pyle et.al. 1997,Ortiz-Crespo, F. I. 1971). This limits evaluations to "population" level conclusions and models must be used to infer individual details. In this report I have relied on photography to capture molt progress on an individual living hummingbird. High-speed shutter photography allows an inspection of the outstretched wing. I have employed a Nikon D-90 DSLR for the 2020-2021 season and Nikon D-7500 DSLR for the 2021-2022 season, both combined with a Sigma 400-600 mm zoom telephoto lens (at 600m). From the photos the number of growing and remaining primaries are determined, and the date at which each primary is dropped is noted. Scoring consists of the date for each primary feather drop. Note that this scoring differs from that employed by Pyle et.al. 1997 where hand specimens allowed scoring based on full replacement. Data for primary molt in Table 1.

Additionally, as a proxy for body feather molt a visual estimate of the percent orange feathers on the bird's back were made every several days. While subjective and uncertain to plus or minus some 5 percent or so, taken together as a series the progress of the body feather molt can be determined. Data for body feather molt in Table 2.

Neither secondaries nor retrices are included in this study due to lack of photographic evidence. All the data were plotted with date as the independent variable, dependent variables "Primary score" and "Percent orange on back" were plotted on the same chart with separate primary and secondary axes. Linear regressions calculated using Microsoft Excel (tm).

All photographs and notes were archived on eBird and eBird checklist numbers are provided in the report for reference to the original data.

Table 1

Date	Score	Drop	Interval days	eBird checklist
11/22/2020	1	P1		S76565340
11/30/2020	2	P2	8	S76906719
12/5/2020	3	P3	5	S77107653
12/18/2020	4	P4	13	S77630252
12/28/2020	5	P5	10	S78160702
1/4/2021	6	P6	7	S78666837
1/16/2021	7	P7	12	S79350327
1/26/2021	8	P8	10	S79942981
2/21/2021	9	P10	26	S81886876
3/3/2021	10	P9	10	S82710701

Figure 3.

Table 1. Observed Primary feather drop dates in molting Rufous hummingbird overwintering in west Houston / Katy Texas, 2020-2021 winter season.

Table 2

Date	Score	% orange on back	eBird checklist
11/23/2020	5	back 5% orange	S76600664
12/3/2020	5	back 5% orange	S77016366
12/16/2020	10	back 10% orange	S77555616
12/23/2020	10	back 10% orange	S77887503
12/25/2020	15	back 15% orange	S77964106
12/30/2020	10	back 10% orange	S78267114
1/4/2021	15	back 10-15% orange	S78666837
1/8/2021	20	back 20% orange	S78884038
1/12/2021	40	back 40% orange	S79140025
1/18/2021	45	back 40-50% orange	S79506683
1/24/2021	60	back 60% orange	S79833316
1/27/2021	65	back 60-70% orange	S79980182
1/30/2021	75	back 70-80% orange	S80153589
2/6/2021	90	back 90% orange	S80531540
2/7/2021	95	back 95% orange	S80597841
2/21/2021	95	back 95% orange	S82093386

Table 2. Estimated percent back orange body feathers by date in molting Rufous hummingbird overwintering in west Houston / Katy Texas, 2020-2021 winter season.

DISCUSSION

Age and sex determination:

Age and sex determination of the bird was made following the procedure given by Stiles, 1972. Rufous on the birds' back indicates a Rufous hummingbird as described by McKenzie and Robbins, 1999. By 18 Feb 2021 (Figure 4) the bird had a solid rufous back. The following notes are given with reference to photos posted on eBird for given dates and Checklist number.

22 Nov S76565340 / 23 Nov S76600664
Photo of hovering bird. Note bird hovers to feed.
1b. Entire throat heavily spotted/streaked with dusky bronze, one bottom center red feather. Indicates immature bird.

28 Nov S76800051
Motion blur photo of tail spread, color pattern on retrices clearly visible.
1b. Throat whitish with rows of green/bronzy flecks. Indicates immature bird.
Hovering bird facing feeder.
4a. Retrix 1 with basal 2/3 3/4 rufous, tip green and black. Indicates immature male.

9 Dec S77273518
Tail spread photo.
4a. Retrix 1 with basal 2/3 3/4 rufous, tip green and black. Indicates immature male.
5a. Retrix 5 wide, emargination tip R2 not seen.

The images and notes establish the identity of the overwintering bird as an immature male Rufous hummingbird.

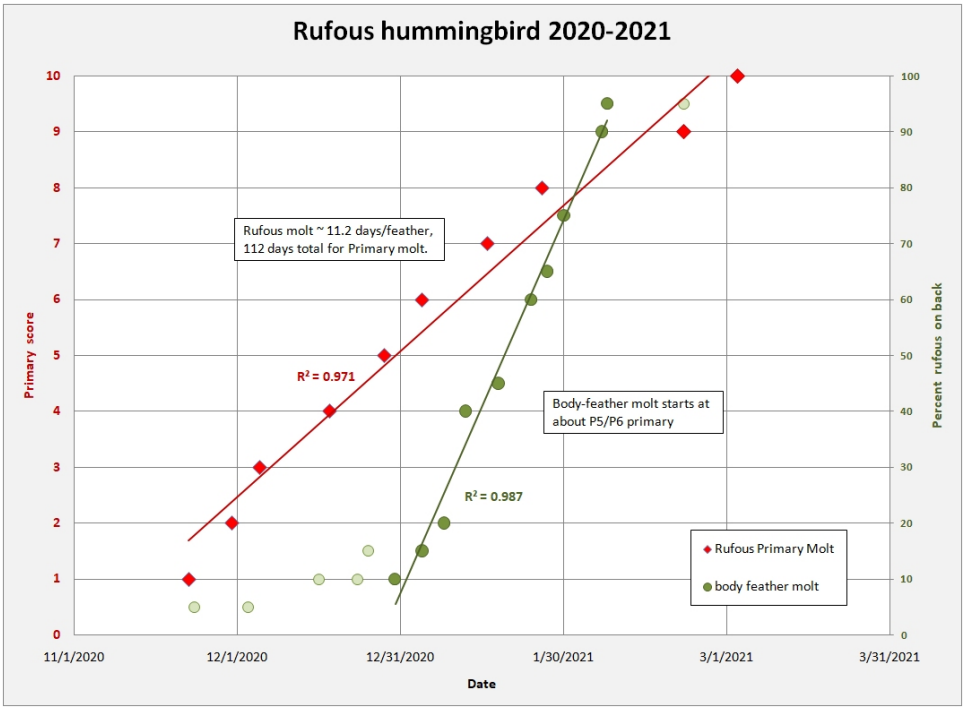

Figure 1. Timing of Primary and Body feather molt in Rufous hummingbird. Independent variable axis is the calendar date. Primary-axis (red diamond) dependent variable is the primary score and the Secondary-axis (green circle) variable is the percent orange on the bird's back. Regression for the primary score utilizes all the data while the regression on the body feather data only applied to the duration of active body feather molt.

Primary Molt:

Primary feather molt started on 22 November with the dropping of P1. Over the next two months the primaries dropped on an average of about 9.5 days per primary (range of 5 to 13 days). Then there was a gap of 26 days between P8 and P10 after which P9 dropped 10 days later. Progress as a whole averaged 11.2 days per primary. The plot suggests the molt proceeded on a 9.3 days/drop both before and after the 26-day gap, that is, something may have happened to cause the gap. The period between P8, 26 January, and P10, 21 February included an unseasonable 5-day hard freeze from 14 to 19 February. Normally I would imagine there was time between 26 January and 14 February (18 days) for the dropping of P9. Therefore the actual cause of the 26 day delay remains uncertain.

The overall period between drops of P1 and P9 spanned 101 days, divided by 9 intervals this gives the average 11.2 days per drop. Adding the last interval to the total yields 112 days for the molt period by the definition used in this report. Molt progression used by Pyle,Howell, and Yanega, 1997, is defined as the full replacement of the primaries. Their model for Rufous primary progression gives a period of 126 days. The Rufous studied in this report dropped its final primary P9 on 3 March and had left the garden by 13 March, 2021. The time for P9 to reach "full replacement" was not observed nor would it have been observable via photographic means. The data presented here is compatible with Pyle et. al. although possibly a bit shorter. Importantly, their predicted mean start and end dates for Rufous on their Mexican wintering

grounds date from 24 Sep to 28 Jan. Our Rufous on the Gulf Coast wintered from 22 Nov to 13 Mar, two months behind the predicted dates. Hill, Sargent and Sargent, 1998, noted that Rufous hummingbirds are absent from the western United States by early September yet the majority of wintering Rufous in the southeast do not arrive until November or December. They find no adequate explanation to account for the gap.

Body feather Molt:

From the beginning the Rufous had a small percentage of rufous feathers on an otherwise green back. This situation was monitored every few days with visual estimates of the percent orange on its back. The situation remained stable until the end of December 2020. During the month of January the bird's back rapidly changed color from dominantly green to dominantly rufous, (Fig. 1). The change from stable background to active body feather molt occurred about the time when primary P5 to P6 dropped. End of the body feather molt was in the first week of February during the time gap between P8 and P10 drops and prior to the hard freeze of 14 Feb.

Primary molt comparison to 2021-2022 Allen's:

Table 3

Date	Score	Drop	Interval days	eBird checklist	Bird
12/15/2021	8	P8		S98935894	B
12/20/2021	8	P8		S99041979	A
01/01/2022	9	P10	12	S99856952	A
01/16/2022	10	P9	15	S100860804	A

Table 3. Observed Primary feather drop in molting Allen's hummingbird in west Houston / Katy Texas, December 2021

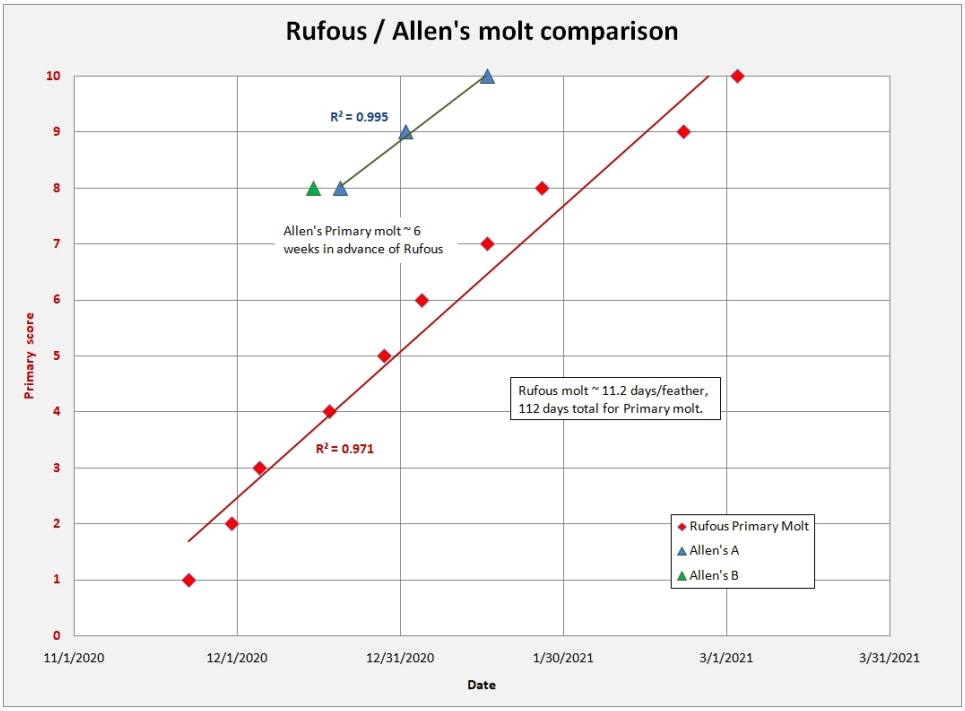

Figure 5.

Figure 2. Timing of Primary feather molt in Rufous hummingbird overwintering on 2020-2021 season compared to stage of molt in Allen's hummingbird observed in 2021-2022.

On 15 December 2021 a Selasphorus visited the garden (Bird B: Table 3), announced by an immediate skirmish with a local Ruby-throated hummingbird. I managed to make an audio recording of the event and get photographs. Working first with the audio I noted a curious "chirrup" on the recording and clipped it to send to BirdNET for identification. There I was surprised to get a suggested Allen's ID. Going quickly to the photographs I was rewarded with a shot of the bird with spread tail. The bird had a green back with retrices lancelate in form and narrow confirming an Allen's ID. Additionally I noted that the bird was in an advanced stage of primary molt having molted P1 through P8, leaving P9 and 10 waiting. This was unusual for a mid-December hummer.

Three days later on 18 December I noted the arrival of a second Selasphorus, (Bird A) readily distinguished from the first by its throat pattern. It too had an advanced molt with P1-P8 growing in. On 20 December I managed to photograph its tail with narrow R5's. Two Allen's in the same garden at the same time in Houston is rare and I assembled the relevant notes and photos and forwarded them to Sheri Williamson, Director/Naturalist, Southeastern Arizona Bird Observatory, Bisbee, Arizona. She kindly replied a few days later confirming two juvenile male Allen's. She noted the advanced stage of molt in addition to the retrices in her explanation for the identification.

In the above Figure 2, I have plotted the 2020-2021 Rufous primary molt progress and with it for comparison I have included the two Allen's from the 2021-2022 season. Note that with the Allen's I did not see the actual primary drop so P8 drop occurred some days prior to the observations. Further observations on Bird A gave approximate drop dates for P9 and P10 as well. Passing a regression line through the points suggest that Allen’s molt progression runs about six-weeks in advance of the 2020-2021 Rufous. Given that Selasphorus are found on the Gulf Coast and SE United States in the winter season, I believe the stage of primary molt should be an important observation to include in any Rufous/Allen's determination.

CONCLUSION

Rufous hummingbirds overwinter frequently on the Texas Gulf Coast. This provides a good opportunity to study the winter molt cycle of the species at your garden feeder utilizing good photographic equipment and some patience. In the 2020-2021 winter season the prebasic molt of a Rufous hummingbird was observed and recorded photographically from the first primary drop P1 on 22 November 2020 until the final drop of P9 on 03 March 2021. Body-feather molt proceeded from 04 January to 07 February, 2021.

Results show that the Rufous molt cycle both starts and ends about two months later than the period defined for Rufous wintering on their traditional Mexican region. Due to differences in how the molt cycle is defined using photography in this study, the duration of the molt cycle appears similar to or possibly slightly shorter than the "full replacement" definition of Pyle et.al. 1997.

Winter 2021-2022 sightings of Allen's hummingbirds in the same area showed them to have much more advanced molt progression than seen in Rufous for the same time of year. Allen's molt was approximately six weeks in advance. For a md-December sighting, that translates to a Rufous molting its P4 primary while an Allen's is molting its P8. This is readily visible in photographs with outstretched wings.

With this technique it should be possible for more data to be applied to the question of the Rufous winter molt on the Gulf Coast. The patch birder is strongly encouraged to spend more time photographing and analyzing their hummingbird photographs for molt progress. Finally, paying attention to the molt progress may prove very helpful in distinguishing Rufous from Allen's.

Figure 3. Rufous 18 Dec, 2020 S77630252
Original feathers P5 through P10 still in place, P4 now missing.

Figure 4. Rufous 18 Feb, 2021 S81886876
One wing clearly shows both P9 and P10 waiting to molt.
Back of bird nearly entirely rufous.


Figure 5. Allen's 15 Dec. 2021 S98935894
This individual is well along in its primaries molt, only P9 and P10 to go. P1-P8 growing in.

ACKNOWLEDGEMENTS

I wish to extend a special thanks to Sheri Williamson of the Southeastern Arizona Bird Observatory for her patience in guiding me through some difficult hummingbird identifications. I turned to her perhaps too often and she always came through with thoughtful and thorough answers. To Cornell and Audubon I thank them for their initiative in creating the marvelous

eBird resource. This provides a great way to capture, archive and disseminate bird observations globally.

Finally I wish to thank Mr Féroce* in choosing my garden for his overwinter molt of the 2020-2021 season. Also for his insistence on feeding "on the wing". This greatly facilitated the photographic capture of his extended wings thus making possible this study.

* Did I mention that Mr Féroce speaks French? Well he does.

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