

# A NEW HYBRID HUMMINGBIRD, *ARCHILOCHUS ALEXANDRI* × *SELASPHORUS SASIN*

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On 16 May 1968 we observed two unusual male hummingbirds at Courtland, Sacramento County, California. We had been informed of the presence of these birds by Mr. and Mrs. Arvil Parker, whose yard had been visited regularly by the two hummingbirds since 28 April 1968. It was immediately apparent that these individuals were not referable to any known species of North American hummingbird. Although they resembled the locally abundant Black-chinned Hummingbird (*Archilochus alexandri*), they also showed unmistakable influence of *Selasphorus* through the presence of abundant rufous pigmentation on the tail, flanks, and back. Perhaps the most distinctive field mark of the hybrids was the gorget, which was different in color and form from that of *Archilochus* and the two species of *Selasphorus* that occur in central California.

Both of the hybrids were captured alive, together with seven *A. alexandri* and one male Allen Hummingbird (*Selasphorus sasin*). In accordance with the wishes of the Parkers, one of the hybrids was released after we had carefully observed its plumage and removed an outer rectrix for later comparison with study skins. The second hybrid was maintained at Berkeley in a large aviary where its behavior was observed and compared with that of examples of *A. alexandri* and *S. sasin*. (These observations will be included in a behavioral study of hummingbirds to be published by Fernando Ortiz-Crespo.) On 22 May 1968 the hybrid died and the skin was deposited in the Museum of Vertebrate Zoology (No. 158783). Samples of blood, pectoral muscle, and testis tissue were taken for biochemical and karyological tests.

## ACCOUNT OF THE HYBRID

The following description is based upon data gathered from the second hybrid. While it was impossible to make comparably detailed observations on the bird that was released after brief examination in the hand, the plumage

characters of this individual appeared to be closely similar to those of the specimen that was preserved.

The specimen is an adult male in breeding condition (left testis 2.5 × 2.0 mm) and weighed 3.2 g at the time of capture (the other hybrid weighed 3.3 g). On the basis of coloration, pattern, and certain mensural characters, the specimen appears to be intermediate between *A. alexandri* and either *Selasphorus sasin* or *S. rufus*. The fact that the outermost rectrices of the hybrid are slightly wider than those of *S. sasin* but are narrower than those of either *S. rufus* or *A. alexandri* suggests that *S. sasin* is involved in the cross. This conclusion is supported by the absence in the hybrid of rufous pigment in the mid-dorsal region. The zoogeographical relationships of the two species of *Selasphorus* also indicate *S. sasin* as the most likely parent. The Rufous Hummingbird (*S. rufus*) occurs as a migrant in most of California. The only reliable breeding records for this species in the state are in the mountains of Trinity County, more than 150 mi. NW of Courtland (Talmadge 1953). The Allen Hummingbird, on the other hand, is a common breeding bird in the coastal hills 45 mi. W of the locality where the hybrid was taken (Grinnell and Miller 1944), and in recent years it has been observed to remain in the Courtland area throughout the breeding season (A. Parker, pers. comm.). We observed at least two adult males and an immature bird of this species in the same locality where the hybrids were taken. It thus seems very likely that the two hybrid hummingbirds represent crosses (or a single cross) between *A. alexandri* and *S. sasin*.

## DESCRIPTION

Adult males of the presumed parental species were used in all comparisons.

*Capital tract.* The crown feathers of *A. alexandri* appear dark green and dusky gray. The corresponding feathers in *S. sasin* lack the extensive dusky color and have much rufous mixed with the green. In the hybrid

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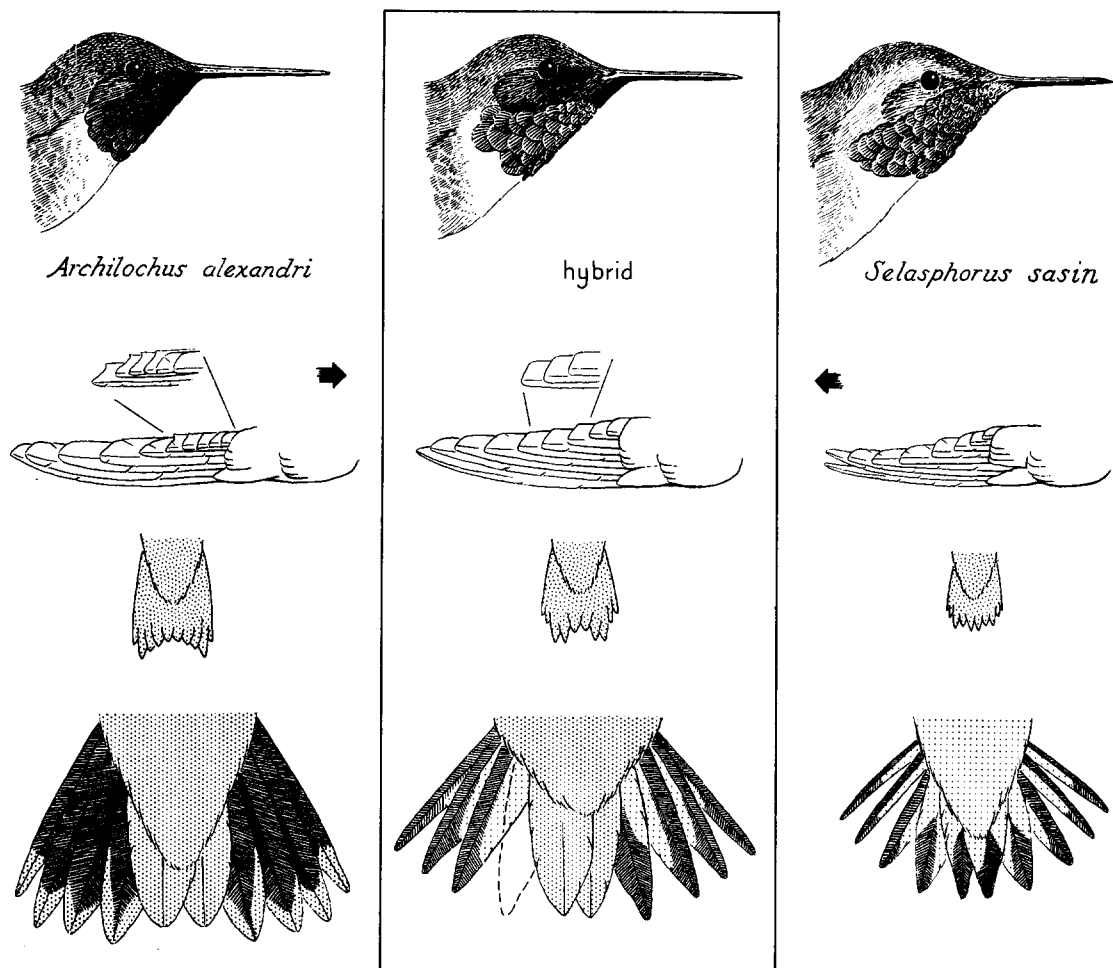


FIGURE 1. Comparison of gorget, wing, and tail shapes in the hybrid and two parental species. In the large drawings of the tail, heavy stipple = green, light stipple = rufous, hatching = black.

these feathers are similar to those of *A. alexandri*, but traces of rufous pigment are present.

The frontal and loreal regions are sooty greenish in the Black-chinned Hummingbird and mixed rufous and green in the Allen Hummingbird. The hybrid is intermediate, but closer to the former species, showing a gray-green color with a trace of rufous. Both parental species and the hybrid have white postorbital spots.

*Spinal tract.* In both species the dorsum appears bronze-green, but in *S. sasin* considerable rufous is admixed, especially in the dorsolateral region. The hybrid is intermediate, showing traces of rufous in the dorsolateral region.

*Ventral tract.* Feathers of the malar and auricular regions are uniformly blackish in *A. alexandri* and rufous in *S. sasin*. In the hybrid these feathers are gray-black with fine brownish flecks.

The gorgets of the two species are similar in general form, except that the iridescent

feathers extend farther posteriorly in the Allen Hummingbird than in the Black-chinned Hummingbird (fig. 1). The hybrid is intermediate in this respect. In *S. sasin* the entire gorget is brilliant orange-red. All the gorget feathers have rufous bases. In *A. alexandri* the posterior half of the gorget is deep purple. The feathers in this region have sooty gray bases separated from the purple tips by an iridescent greenish stripe. The anterior half of the gorget is dull black. In the hybrid, the posterior two-thirds of the gorget is composed of feathers that have sooty bases and red-purple tips that become deeper purple along the extreme distal margin. The iridescent green stripe characteristic of *Archilochus* is present, but reduced in the hybrid. The anterior third of the gorget of the hybrid is composed of feathers with brownish bases and sooty tips.

The sternal and abdominal regions are smoothly blended rufous and white in *S. sasin*, while in *A. alexandri* these areas are faintly barred greenish and gray with no trace of

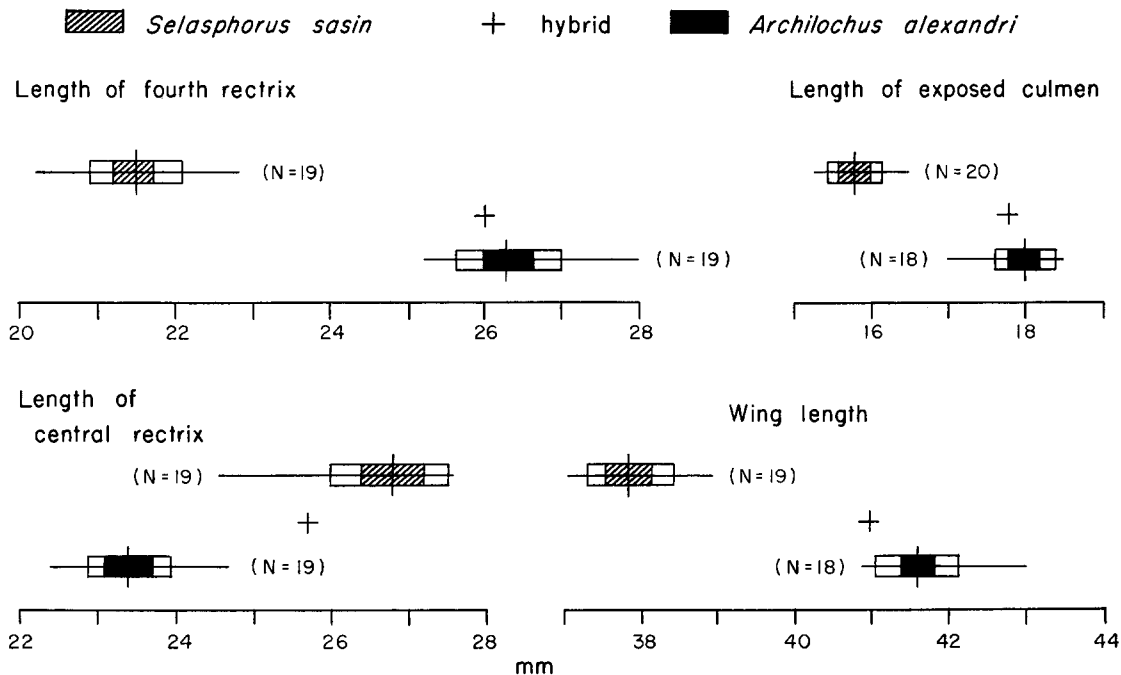


FIGURE 2. Comparison of mensural characters in the hybrid and representative series of the parental species. Horizontal lines show the range of measurements, vertical lines indicate the mean. The open rectangles mark the standard deviation of the samples. The black and patterned rectangles indicate the 95 per cent confidence limits for the mean.

rufous. The hybrid is close to the latter species in the overall appearance of the ventral region, but some rufous is present, especially on the flanks and lower abdomen.

**Alar tract.** The small feathers of the leading edge of the wing distal to the wrist are rufous in the Allen Hummingbird, while in the Black-chinned Hummingbird they are sooty with a white margin and brownish tips. The hybrid is intermediate, having both sooty and rufous in these feathers but lacking white.

Primaries 9 and 10 of male Allen Hummingbirds are narrow and pointed, while in the Black-chinned Hummingbird these feathers are wider and well-rounded. As can be seen from figure 1, the outer primaries of the hybrid are intermediate in form.

In *A. alexandri* primaries 3-7 are angular in outline and possess a peculiar notch on the trailing edge. In *S. sasin* these feathers are much more rounded and lack the notches. In the hybrid the notches are missing, but the feathers are angular in outline.

**Caudal tract.** In *S. sasin* rectrices 1-1 (the central pair) are longest, and 5-5 shortest, the result being a pointed tail shape. In *A. alexandri* rectrices 1-1 are shortest, while 4-4 are longest, producing a forked configuration of the tail. In the hybrid, rectrices 2-2 and 3-3 are longer than the others, and the tail is thus intermediate in shape between the parental species (fig. 1).

The individual rectrices are narrower in *S. sasin* than in *A. alexandri*, especially in the cases of pairs 4-4 and 5-5. In the hybrid these feathers are intermediate in shape and width.

The pigmentation of the rectrices of the parental species is strikingly different. Viewed dorsally, the rectrices of *S. sasin* are rufous with varying amounts of black on the feather tips and margins. In *A. alexandri* rectrices 1-1 are iridescent green, while the others are purple-black with faintly greenish tips. The hybrid is clearly intermediate, exhibiting rufous, green, and blackish coloration.

#### MENSURAL CHARACTERS

The parental species are similar in overall body size, as measured by body weight (mean = 3.3 g for *S. sasin* vs. 3.1 for *A. alexandri*). The two hybrids (3.2 and 3.3 g) are well within the range of variation of both species.

Despite the similarity between the parental species in body weight, there is essentially no overlap in wing length, length of culmen, length of central rectrix, and length of fourth rectrix (fig. 2). In all these characters the hybrid falls between the means of the two species. It is impossible, however, to separate the hybrid from the parental species on reliable statistical grounds, since in every case the hybrid's measurements fall within the observed limits of variation of one or the other parental distribution.

## DISCUSSION

It seems certain that the attainment of local sympatry between *S. sasin* and *A. alexandri* in the Sacramento Valley has occurred very recently. In this case, as in so many others, the spread of a species (*S. sasin*) has probably been made possible by human alteration of the original habitats of the region. Specifically, the ecological and microclimatic aspects of the Sacramento Valley have been drastically changed by the introduction of irrigated orchard and ornamental trees and by the planting of flowering forbs and shrubs. These changes have evidently been sufficient to allow *S. sasin*, a species normally restricted as a breeding bird to the relatively sheltered and moist conditions of the coastal chaparral belt (Miller 1951), to invade an area that was formerly unsuitable. In California, *A. alexandri* is a typical species of the warm, relatively dry interior valley, and has been able to adjust quite well to human influence, such that it is extremely common in many agricultural and residential areas (including Courtland). Whether or not future observations indicate that frequent hybridization between the two species, reflecting a chronic breakdown of ecological and/or behavioral isolating mechanisms, is an integral part of this newly attained sympatry, the situation is of considerable ecological and zoogeographical interest.

The question of hybrid fitness is, of course, an important one. As judged by size, apparent physical condition, and aggressive behavior toward other hummingbirds, the somatic fitness of the hybrids did not appear unusually high or low, relative to the local examples of the parental species. The fact that both hybrids had survived for at least a year and had presumably undergone a round-trip migration to Mexico indicates a lack of gross somatic defects. While direct evidence of reproductive viability is lacking, the specimen collected did have normally enlarged testes and abundant spermatocytes in the testicular lumina.

The discovery of this new intergeneric North American hybrid hummingbird combination, bringing the total number of such combinations to at least 10 (see Banks and Johnson 1961; Short and Phillips 1966), lends additional support to the oft-expressed view (Taylor 1909; Sibley 1957; Williamson 1957; Banks and Johnson 1961; Short and Phillips 1966) that the time is ripe for a thorough study of the generic limits within the Trochilidae. Biochemical methods promise to provide some of the new kinds of characters that will be required in such a study. Our own

preliminary attempts along these lines have not been successful. Fred McCollum examined extracts from pectoral muscle and blood by means of starch gel electrophoresis. Specific stains for lactate dehydrogenase (LDH) and hemoglobin revealed no significant differences among the parental species and the hybrid in the electrophoretic mobility of either of these proteins. Further work, now in progress, may reveal the existence of suitably sensitive biochemical taxonomic characters.

## SUMMARY

Two adult male hummingbirds of the hybrid combination *Archilochus alexandri* × *Selasphorus sasin* were observed in Courtland, Sacramento County, California, in late spring, 1968. Both birds were examined in the hand; one was collected and is described in detail. This new hybrid combination raises to at least 10 the number of intergeneric hybrid hummingbird crosses reported from North America. The hybridization is viewed as one result of the recent attainment of sympatry of the parental species in the Sacramento Valley, California.

## ACKNOWLEDGMENTS

We wish to thank Mr. and Mrs. A. Parker, whose keen observation led to our recognition of the hybrids. F. Ortiz-Crespo and W. Davis provided valuable logistic support, without which the birds might not have been captured alive. F. McCollum kindly performed the electrophoretic tests on extracts from the blood and pectoral muscle of the hybrid specimen and examples of both parental species. N. K. Johnson read the manuscript and offered critical advice and stimulating discussion on problems concerning hummingbird hybridization. Gene M. Christman prepared the illustrations.

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