Species Recognition in the *Hyla versicolor* Complex

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ABSTRACT

A historical review of the taxonomical treatment of treefrogs known as *Hyla versicolor* is presented. After the original species description in 1825, three subspecies were recognized as *H. v. versicolor*, *H. v. chrysoscelis*, and *H. v. sandersi*. Subsequent experimental studies indicate little or no biological validity for these taxa and two cryptic species are recognized determined by the trill rate of the male's call. The fast call type (34 to 69 trills per second) is recognized as *H. chrysoscelis* and the slow call-type (17 to 35 trills per second) as *H. versicolor*. *Hyla v. sandersi* is synonymous with *H. chrysoscelis*.

INTRODUCTION

The objective of this report is to provide taxonomic recognition for two treefrog species currently grouped in the *Hyla versicolor* complex. Blair (1958) reported two call-types from *H. versicolor* populations and speculated that two species were represented as data were pointing toward calls as anuran isolating mechanisms. Prior to Blair's paper, all taxonomic studies involved morphological variation and three subspecies have been reported. Eighty-five years after Le Conte (1825) described *H. versicolor*, Strecker (1910) reassigned *H. femoralis chrysoscelis*, originally recognized by Cope (1880), to *H. v. chrysoscelis*. Smith (1953) placed *H. v. phaeocrypta* described by Cope (1889) as a synonym of *H. v. versicolor*. The name *H. v. sandersi* proposed by Smith and Brown (1947) for populations in south central Texas was not involved in subsequent taxonomic considerations.

Blair's observations clearly cast doubt on the biological validity of these subspecies and formed the background for the experimental analyses that followed. His study recognized a fast and slow call-type expressed in trill rate and provided an initial picture of their geographic distribution. These data posed two specific questions; (1) were females discriminating between male calls in areas of call-type overlap and (2) were F_1 hybrids existing as a significant component of natural populations.

DISCUSSION

A solution to the second question was sought first. If these hybrids exist, the two call-types must possess a high incidence of interfertility and this condition was experimentally analysed through crosses between the call-types (Johnson, 1959). The data revealed such a surprisingly high degree of incompatibility compared with control crosses that existence of two species was essentially confirmed. Whereas the incompatibility is assumed to have a chromosomal gene basis, the differences found between reciprocal crosses indicate a complex phenomenon possibly involving a cytoplasmic effect.

Subsequent to recognizing the incompatible gene-association between call-types, the question of female discrimination for call was experimentally evaluated. Littlejohn, *et al.* (1960) reported the results of these tests indicating definite female capacity to discriminate between the fast and slow trill rates. Evidence was complete for establishing the existence of two species. Available data on distribution, however, indicated that populations of the slow call-type in southeast Texas were possibly disjunct from similar populations in the east. The continuity of the fast call-type occurring to the west of these Texas slow call-type populations with other fast call-types to the east and north is still open to question. In view of the pronounced incompatibility discovered between adjacent populations of unlike call-type, it appeared important to analyse crosses between similar call-types from the disjunct populations. These tests were made using Texas and North Carolina breeding stocks (Johnson, 1963). The results were similar to those obtained between and within call-types for adjacent and overlap populations. The genetic compatibility tests indicate therefore that only two species are involved.

A high heritability of call-type is to be expected in view of its isolating function. Blair's study (1955) found evidence that environmental influences on trill rate were not sufficient to obscure the observed differences and the readily-detected calls of both types simultaneously in areas of overlap by many collectors confirm this conclusion. All following figures represent direct measurements of sound spectrograms having no form of environmental correction. The call-type distributions as currently known are shown in Figure 1. The type locality of *H. v. chrysoscelis* is Dallas, Texas. (Schmidt, 1953) and is presently occupied by fast call-type frogs. The fast call-type is therefore referred to as *H. chrysoscelis*. The subspecies *H. v. sandersi* has its type locality near Somerset, Atascosa Co., Texas, (Schmidt, 1953) being well within the range of *H. chrysoscelis* and seems purely

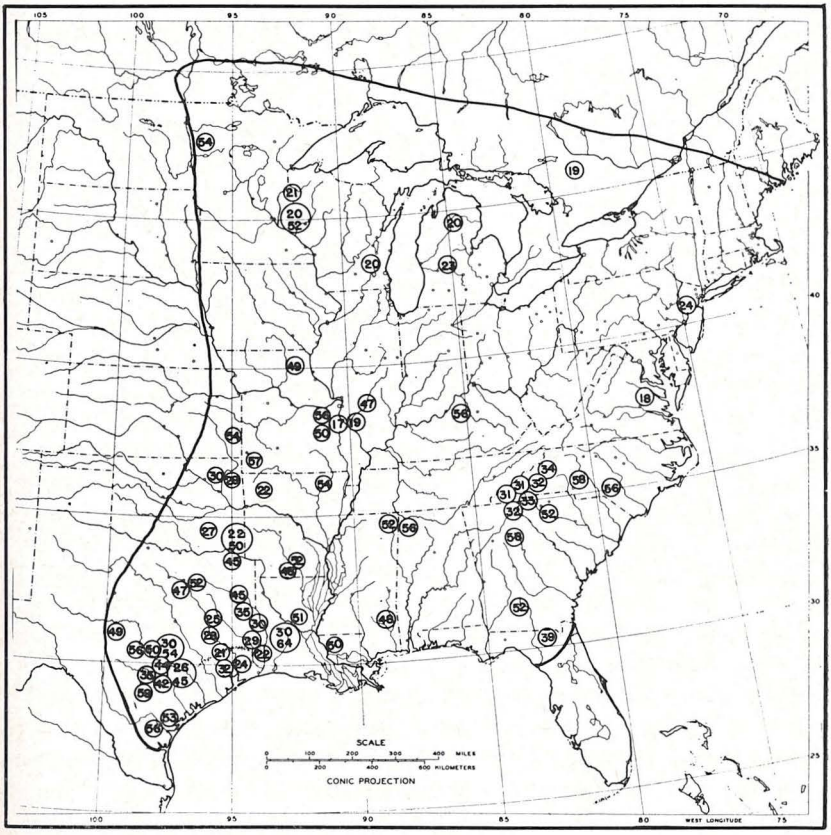

Fig. 1. Geographic distribution of the two trill rates. Figures given are station means for trills per second. Circles enclosing two values represent stations at which both fast and slow call-types were recorded. See text for distinction between trill rates.

synonymous with that species. The type locality of *H. versicolor* was near New York, New York, and, while no call recordings exist from the area, appears to be clearly in the known slow call-type area. *Hyla versicolor* is therefore retained for the slow call-type.

Ninety-four and 128 individuals of *H. versicolor* and *H. chrysoscelis* provided call data on 477 and 596 calls respectively. These data allow construction of the following dichotomous key.

A trill rate of 34 to 69 trills per second with a mean of 51.3 ± 8.22 ..... *chrysoscelis.*

A trill rate of 17 to 35 trills per second with a mean of 24.9 ± 6.40 ..... *versicolor.*

During the experimental studies cited above, various morphological measurements were made seeking structural differences between the species. None were found. During the periods of field work, the author came to the impression that *H. versicolor* males took higher calling stations than *H. chrysocelis* males in areas of overlap. The color of freshly ovulated eggs appeared to be much darker (presumably more melanin present) in *H. versicolor* than in *H. chrysoscelis*. Other than these subjective differences, the only known method for recognizing non-bred individuals lies in the call structure and, to some extent their geographical origin. Further studies should reveal differences not requiring sound spectograms.

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