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EXTRA-LIMITAL BREEDING POPULATIONS OF THE CHESTNUT-SIDED WARBLER (*DENDROICA PENSYLVANICA*) IN SOUTH-CENTRAL INDIANA

Donald R. Whitehead, Scott Gremel, and Kevin D. Gibson
Department of Biology
Indiana University
Bloomington, Indiana 47405

ABSTRACT: Studies of neotropical migrant bird communities in south-central Indiana have revealed breeding populations of chestnut-sided warblers (*Dendroica pensylvanica*) 200 km south of the range reported by Mumford and Keller (1984). These populations occur in young clearcuts in both Hoosier National Forest and state forests that are characterized by high densities of small woody stems and low canopy height. The species is not present in older timber cuts (10 to 21 years post-cutting). As chestnut-sided warblers have also been reported recently from clearcuts in the Shawnee National Forest in southern Illinois and occur in the vicinity of the Wayne National Forest in southeastern Ohio, recent forest management practices have probably led to the establishment of these localized populations in the lower Midwest.

KEYWORDS: Chestnut-sided warbler, *Dendroica pensylvanica,* extra-limital populations, forest management, range extensions.

INTRODUCTION

In the summer of 1985, territorial male chestnut-sided warblers (*Dendroica pensylvanica*) were discovered in three young clearcuts in the Pleasant Run Unit of Hoosier National Forest. These records were of great interest, as Mumford and Keller (1984) indicate that the southern limit of the breeding range in Indiana lies in the northern portion of the State. As chestnut-sided warblers (CSWA) were again found in young clearcuts in the summer of 1986, the authors decided to study the species more carefully, determine the breeding status of these extra-limital populations, and gather more data on the species' distribution within the Midwest.

The status of the chestnut-sided warbler in Indiana is re-evaluated in this paper based on data from Breeding Bird Survey routes (BBS), Indiana Audubon Society Summer Bird Counts (SBC), and the Indiana Breeding Bird Atlas project (BBA) as well as on our own fieldwork.

HISTORICAL CHANGES IN THE STATUS OF THE CHESTNUT-SIDED WARBLER

Mumford and Keller (1984) indicate confirmed nesting for the species in Allen, Lagrange, Marshall, Newton, and Porter Counties in northern Indiana, with a sporadic occurrence of singing males south to the latitude of Montgomery,

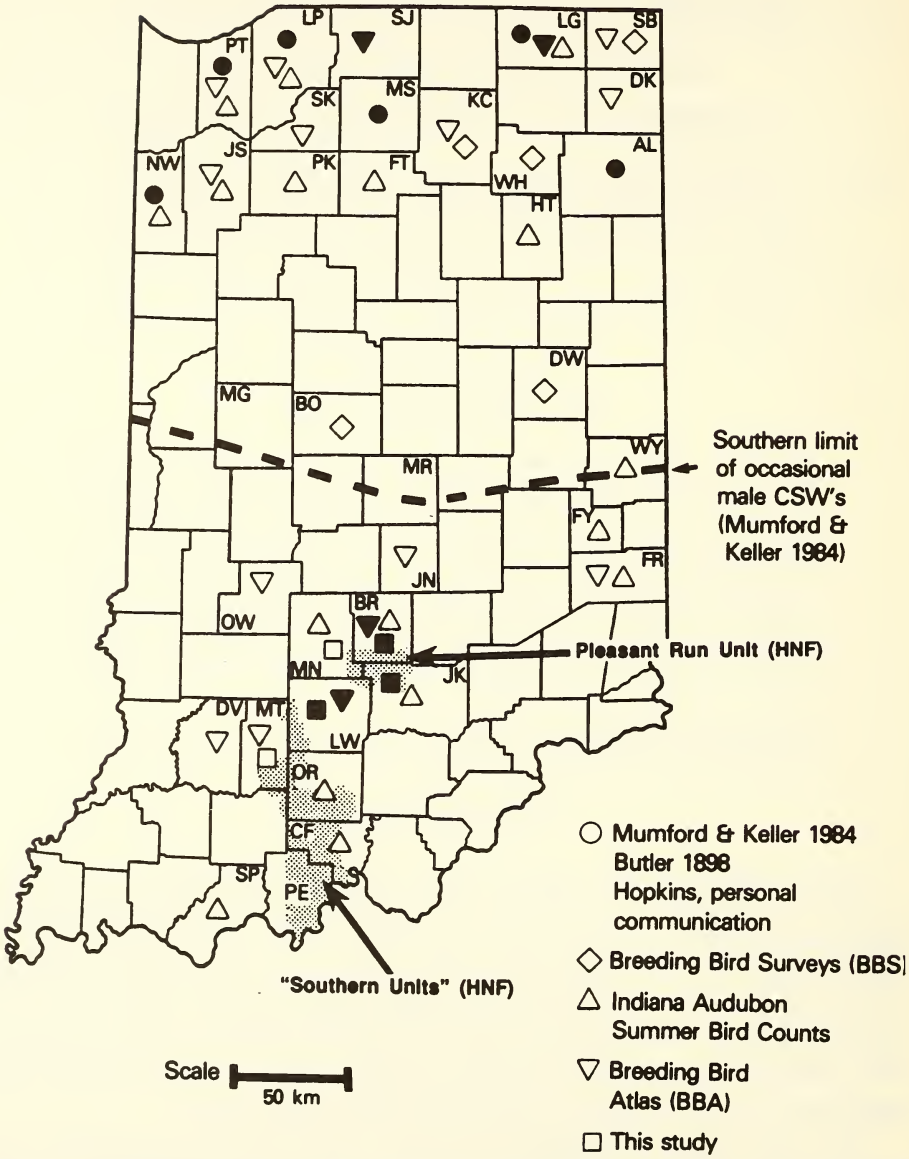

Figure 1. Distribution of the chestnut-sided warbler in Indiana. Symbols indicate data sets from which observations were derived. Filled-in symbols indicate breeding confirmations. Two letter symbols indicate counties (AL = Allen; BO = Boone; BR = Brown; CF = Crawford; DV = Davies; DK = Dekalb; DW = Delaware; FY = Fayette; FR = Franklin; FT = Fulton; HT = Huntington; JK = Jackson; JS = Jasper; JN = Johnson; KC = Kosciusko; LG = LaGrange; LP = LaPorte; LW = Lawrence; MR = Marion; MS = Marshall; MT = Martin; MN = Monroe; MG = Montgomery; NW = Newton; OR = Orange; OW = Owen; PE = Perry; PT = Porter; PK = Pulaski; SJ = Saint Joseph; SP = Spencer; SK = Starke; SB = Steuben; WY = Wayne; and WH = Whitley).

Marion, and Wayne Counties (Figure 1). They also mention the occurrence of a single singing male in Spencer County in the southwestern corner of the State on 18 June 1980.

A similar pattern is evident for both Ohio and Illinois, where breeding appears to be restricted largely to the northern portions of these States, but with scattered individuals noted south of those areas (Peterjohn, 1989; Bohlen, 1989). Peterjohn (1989) suggested that the chestnut-sided warbler population in Ohio has expanded slowly in recent years resulting in a small breeding population in Hocking and Fairfield Counties in south-central Ohio and occurrences on the unglaciated Allegheny Plateau.

Obviously, the distribution and abundance of the chestnut-sided warbler have changed dramatically over the past two centuries. It was an extremely rare breeding species restricted to early successional habitats in the deciduous forests of eastern North America in the 18th and early 19th centuries (Bent, 1953; Morse, 1989). The extensive deforestation of the late 1800s and early 1900s followed by abandonment of some agricultural and pasture land created an abundance of appropriate habitat into which the species could spread. As a result of this habitat change, the chestnut-sided warbler became one of the most common breeding birds in eastern North America (Bent, 1953; Morse, 1989).

The former rarity of the species was undoubtedly a function of both breeding ground limitation (paucity of early successional habitat) and a lack of behavioral plasticity. For example, Greenberg (1979, 1983, 1984a, 1984b; also Morse, 1989) demonstrated that the chestnut-sided warbler is highly specific in habitat selection and displays a stereotyped foraging repertoire.

This scenario undoubtedly applies to the Midwest, where the chestnut-sided warbler occurs in forest edges, brushy second-growth, and young deciduous forests (Mumford and Keller, 1984; American Ornithologists' Union, 1983; Bohlen, 1989; Peterjohn, 1989; Collins, *et al.,* 1982). Although the chestnut-sided warbler was associated with oak savannahs in northwestern Indiana and northwestern Ohio (Mumford and Keller, 1984; Peterjohn, 1989; Bohlen, 1989), large numbers of chestnut-sided warblers anywhere in the lower Midwest are hard to imagine prior to the beginning of extensive land clearance in the mid-1800s (Parker 1989). For example, Butler (1898) mentions the chestnut-sided warbler as a summer resident in the extreme northern part of Indiana but indicates confirmed breeding only for LaPorte County.

EXTRA-LIMITAL POPULATIONS OF CHESTNUT-SIDED WARBLERS IN INDIANA: RECENT STUDIES

The initial evidence of extra-limital breeding populations of chestnut-sided warblers came from three young clearcuts in the Pleasant Run Unit of Hoosier National Forest (HNF) in 1985. Singing males were found in each cut, with a maximum of five males in one clearcut. The birds were present continuously from May through late July. Singing males (minimum three, maximum five)

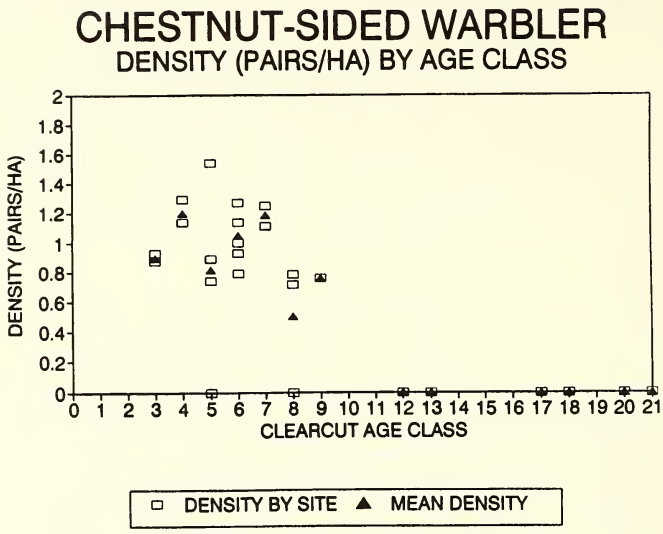

Figure 2. Density of chestnut-sided warblers (pairs/hectare) as a function of successional stage of clearcut (years since cutting).

were also present in these same cuts and one additional site in 1986. This evidence suggested the possibility of a localized breeding population in south-central Indiana.

A detailed study of the changes in breeding bird communities as a function of clearcut age was initiated in 1987 (Gremel, 1989; Gremel and Whitehead, 1989). Gremel censused breeding birds in 14 clearcuts ranging in age from 3 to 21 years post-cutting in 1987-1990 (Figure 2).

Singing male chestnut-sided warblers were present in all clearcuts three to nine years post-cutting, but they were seldom present in cuts more than ten years into succession (Figure 2). The total for 1987 included 29 males (five sites) with a minimum of three at one site and a maximum of eight at another. Density ranged from 0.8 to 1.5 pairs per hectare. The total for 1988 included 31 males (four sites) with a minimum of seven at one site and a maximum of nine at another; density ranged from 1.1 to 1.3 pairs/hectare. The 1989 study totalled 22 males (four sites) with a minimum of four and a maximum of seven; density ranged from 0.7 to 1.1 pairs/hectare. The 1990 totals included 23 males (four sites) with a minimum of four and a maximum of nine; density ranged from 0.7 to 1.2 pairs/hectare.

These data suggest the presence of a localized breeding population. This inference was strengthened by the identification of females on at least one cut in 1986 and additional females (up to four) in every subsequent year.

Actual breeding was confirmed in 1988, 1989, and 1990. The initial confirmation was obtained 22 June 1988 in a four-year old cut in Lawrence County, when a male chestnut-sided warbler was observed carrying food and begging calls were heard nearby. The male disappeared into the cut and reappeared without food. A juvenile then emerged and was observed being fed

Table 1. Characteristics of the sites where chestnut-sided warblers tend to breed.

Habitat Variables				
Age of Clearcut (yr)	Density CSWA (pr/ha)	Density of Stems < 2.5 cm (no/ha)	Density of Stems > 5 cm (no/ha)	Density of *Rubus* (stems/ha)
3	0.9			
4	1.2	18242	152	954
5	0.8			
6	1.0	19782	359	1184
7	1.2	17567	436	1222
8	0.5			
9	0.8			
10				
11				
12	0.0	4888	2449	0
13	0.0	3049	1828	0
14				
15				
16				
17	0.0	6098	2030	0
18	0.0	2151	1755	0
19				
20	0.0	2304	1824	0
21	0.0	2418	1974	0

by the female. The second confirmation was obtained on 11 June 1989 in an eight-year old cut in Brown County, when a female chestnut-sided warbler was observed carrying food to begging young. The third confirmation was obtained from a six-year old cut in Jackson County on 27 June 1990, when both male and female were observed carrying food, one fledgling was seen being fed by the male, and begging notes from a second fledgling were heard.

Additional evidence of breeding was obtained from a three-year intensive mist-netting study in five young clearcuts (1989-1991). Seven chestnut-sided warblers were netted in 1989, four of which were females, one with a well-developed brood patch. The 1990 totals included 13 chestnut-sided warblers (including two females and five hatch-year birds). The 1991 totals included five chestnut-sided warblers (two males and three females). One of 13 chestnut-sided warblers netted in 1990 was recaptured in 1991 (Whitehead, unpub. data).

More recently, intensive investigations of reproductive success of neotropical migrants have found chestnut-sided warbler nests in clearcuts in Yellowwood State Forest (Brown County). A single nest (successful) was found in 1993, and four nests (two successful) were located in 1994.

Lastly, two singing males were heard in an area of dense shrubby vegetation (apparently an abandoned farm) in the southwestern corner of Brown County State Park in June 1994.

These data indicate that there are localized breeding populations of chestnut-sided warblers in the vicinity of the Pleasant Run Unit of Hoosier National Forest. These populations are more than 200 km south of the breeding

range indicated by Mumford and Keller (1984) and appear to exist because of the early successional habitats characteristic of young clearcuts. Our studies have indicated the presence of such "patches" in Monroe, Brown, Lawrence, and Jackson Counties (Figure 1).

The sites in which chestnut-sided warblers breed are characterized by high densities of woody stems 2.5 cm dbh, low densities of stems 5 cm dbh, and low mean canopy height (Table 1). The dominant plant taxa on these young cuts include (in order of mean frequency): sassafras (*Sassafras albidum*), dogwood (*Cornus florida*), greenbrier (*Smilax* sp.), winged sumac (*Rhus copallina*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), tulip tree (*Liriodendron tulipifera*), black gum (*Nyssa sylvatica*), hornbeam (*Ostrya virginiana*), chestnut oak (*Quercus prinus*), bigtooth aspen (*Populus grandidentata*), raspberry (*Rubus* sp.), and white ash (*Fraxinus americana*). Scattered snags, often hickories (*Carya* spp.), were left standing in each clearcut. These snags appear to be important singing perches for territorial males (Gremel, 1989; Gremel and Whitehead, 1989).

Selected habitat variables were analyzed in occupied and unoccupied clearcuts with *t*-tests (Table 1). The characteristics of the 4-7 year-old cuts were compared with those of the 12-17 year-old sites. All variables tested were significantly different between the two classes of sites. The variables analyzed included: 1) the density of woody stems 2.5 cm dbh ($p = 0.0002$; $R^2 = 0.9753$); 2) the density of woody stems 5 cm dbh ($p = 0.0009$; $R^2 = 0.9515$); 3) canopy height ($p = 0.0005$; $R^2 = 0.9632$); and 4) the density of raspberry stems ($p = 0.0002$; $R^2 = 0.9781$).

The bird community which shares these cuts with chestnut-sided warblers is typical of early successional habitats in southern Indiana and includes (in rank order based on pairs/ha): rufous-sided towhee (*Pipilo erythrophthalmus*), white-eyed vireo (*Vireo griseus*), indigo bunting (*Passerina cyanea*), yellow-breasted chat (*Icteria virens*), prairie warbler (*Dendroica discolor*), chestnut-sided warbler, gray catbird (*Dumetella carolinensis*), blue-winged warbler (*Vermivora pinus*), northern cardinal (*Cardinalis cardinalis*), hooded warbler (*Wilsonia citrina*), common yellowthroat (*Geothlypis trichas*), and kentucky warbler (*Oporornis formosus*). Since these initial discoveries, young clearcuts in the southern three units of HNF, Breeding Bird Survey data (provided by Edward M. Hopkins), Indiana Audubon Society Summer Bird Count data (extracted from the Indiana Audubon Quarterly), and data from the Indiana Breeding Bird Atlas project (also provided by Hopkins) have been analyzed (Figure 1).

The Breeding Bird Survey data indicate that the chestnut-sided warbler was rarely encountered. It was noted on only five routes, all in northern Indiana.

Indiana Audubon Society Summer Bird Counts (1980-1988) suggest a more extensive distribution (Figure 1; Jackson, 1981, 1983a, 1983b, 1984, 1985; Jackson and Jackson, 1986, 1987, 1988, 1989). The chestnut-sided warbler was noted in 17 counties with an obvious concentration in the northern tier of counties (for example, birds were noted in Porter County in eight of the nine years). There also appears to be a "patch" in eastern Indiana including Wayne, Fayette, and Franklin Counties and a more extensive extra-limital population in south-central

Indiana extending southward from Monroe, Brown, and Jackson Counties to Orange, Crawford, and Spencer Counties (records from Monroe, Brown, and Jackson Counties are based on our work).

Inferences from the Indiana Breeding Bird Atlas project are similar (Figure 1) in that chestnut-sided warblers were noted in sixteen counties with a concentration in the north. The "patch" in the east is represented by Franklin County, and the south-central population includes records from atlas blocks in Johnson, Owen, Brown, Lawrence, Martin, and Daviess Counties. The Brown County observations come from three different atlas blocks, and all of the sightings are from clearcuts that the authors are studying.

Young timbercuts in the three southern units of HNF were visited during the summer of 1989. Cuts no older than seven years post-cutting were concentrated on, and up to an hour was spent in each cut. If chestnut-sided warblers were not found, an additional ten minutes was spent playing taped vocalizations. Three cuts in the Lost River unit (Martin County) were visited on 22 June 1989, and five males were found in a four-year old cut, but none were found in two seven-year old cuts. On 28 June 1989, three young cuts in northern Perry County and one large cut in southern Perry County were visited, but no chestnut-sided warblers were found.

The chestnut-sided warbler now occurs regularly as a breeding bird in south-central Indiana. It appears to favor young clearcuts, primarily in Hoosier National Forest, and probably breeds every year in such habitats from Brown and Monroe Counties south to Martin (and Orange?) County. These populations occur in the forested uplands of the Highland Rim Natural Region and the Shawnee Hills Natural Region (Homoya, *et al.,* 1985). Individuals occur sporadically in disturbed habitats south of this population.

This "southern" population was probably not present prior to the late 1960s, when some clearcutting was initiated by the Forest Service. This conclusion is supported by the work of Nolan (1978), who studied the prairie warbler on a 50 hectare tract near Bloomington, Indiana, from 1952-1972. Although the chestnut-sided warbler and the prairie warbler are similar ecologically, Nolan recorded no chestnut-sided warblers in the breeding season during the 20-year span of his study (Nolan, pers. comm.).

Apparently, this situation is not unique to Indiana as male chestnut-sided warblers have been found recently in young clearcuts in the Shawnee National Forest in southern Illinois (Robinson, pers. comm.). Some of the chestnut-sided warblers reported from the unglaciated Allegheny Plateau in Ohio (Peterjohn, 1989) may have a similar explanation, as the three major units of the Wayne National Forest are located on the plateau and their forest management histories have been similar to those of the HNF (Landes and Schwalbach, pers. comm.).

DISCUSSION

The colonization of young clearcuts in the lower Midwest by the chestnut-sided warbler is not surprising given what is known concerning the original distribution of the species, data on habitat associations, and evidence for utilization of clearcuts elsewhere in eastern North America. As mentioned previously, the species was once greatly restricted in distribution, apparently

occurring only in localized disturbed habitats such as recent burns, streamside sites subject to destructive flooding, ecotones on the border of beaver ponds, and stunted oak forests in the Applachians (Burleigh, 1927; Kendeigh, 1945; Bent, 1953; Greenberg, 1979, 1983, 1984a, 1984b; Collins, 1983; Collins, *et al.,* 1982; Morse, 1989; Baird, 1990).

The ability of the chestnut-sided warbler to colonize appropriate habitat quickly is demonstrated by its rapid spread into the many early successional patches caused by the chestnut blight in the early 1900s (Bent, 1953). This behavior is consistent with what is known from areas in the Northeast and upper Midwest that have been altered by extensive clearcutting over the past few decades. The chestnut-sided warbler is a common breeding bird in young clearcuts in Nova Scotia, Maine, and New Hampshire (Titterington, *et al.,* 1979; Freedman, *et al.,* 1981; Holmes, pers. comm.). The structural characteristics of the cuts occupied by chestnut-sided warblers in the Northeast are similar to those in which the species now occurs in HNF.

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