Summary of Breeding Bird Trends in the Chippewa and Superior National Forests of Minnesota - 1995-2014

Report to Chippewa National Forest and Superior National Forest, November 2014

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This is NRRI technical report: NRRI/TR-2014/44

Suggested citation:
Zlonis, E.J., A. Grinde, E. Condon, H. Panci, Y. Li, R.R. Regal, and G.J. Niemi. 2014. Summary of breeding bird trends in the Chippewa and Superior National Forests of Minnesota – 1995-2014. NRRI technical report NRRI/TR-2014/44, University of Minnesota Duluth.

SUMMARY

- A total of 329 existing forest stands were surveyed for breeding birds including 135 and 194 stands (953 survey points) in the Chippewa and Superior National Forests (NFs), respectively in 2014.
- Trends in relative abundance were calculated for a total 73 bird species, including 64 species in the Chippewa NF and 63 in the Superior NF for 20 years from 1995 to 2014. All trends are reported as significant when $P < 0.05$.
- The Chippewa NF had 17 species that increased, 7 species that significantly decreased, and 40 species that were relatively stable from 1995 to 2014. Hence, 89 % of the species (57/63 species) with adequate trend information are estimated to be stable or increasing over the past 20 years in the Chippewa NF.
- The Superior NF had 18 species that increased, 12 that decreased, and 33 species that were relatively stable from 1995 to 2014. Hence, 81 % of the species (51/63 species) with adequate trend information are estimated to be stable or increasing over the past 20 years in the Superior NF.
- Eight species increased in both the Chippewa and Superior NFs, including Black-and-White Warbler, Black-throated Green Warbler, Blue Jay, Cedar Waxwing, Nashville Warbler, Pileated Woodpecker, Pine Warbler, and Red-breasted Nuthatch.
- The Connecticut Warbler and Chipping Sparrow were the only species with declining trends in both the Chippewa and Superior NFs.
- All of the guild analyses showed signficant increases during the 1995-2014 period in each NF and regionally except for non-significant trends for bird species associated with early-successional forests and shrub/sub-canopy nesting species. In addition, a non-significant trend was detected for short-distance migrants in the Chippewa NF. The guild trends are primarily influenced by the large number of species that have positive trends relative to the number of negative trends.
- The overall trend information indicates that most breeding bird species within these NFs that we are capable of monitoring and detecting trends are either increasing or stable in populations, while several species such as the Connecticut Warbler, Song Sparrow, and Yellow-bellied Flycatcher continue to have trends that remain a concern.
- This is the third year that trend calculations have been presented without results from the Chequamegon NF. In addition, it is the second year that a regional trend for the combined Chippewa and Superior NFs has been calculated. A broader regional analysis of trends that includes the Chequamegon and Nicolet NF's of northern Wisconsin will be available soon in a USFS General Technical Report (Niemi et al. 2015).

INTRODUCTION

The breeding bird communities of the western Great Lakes region have among the richest diversity of breeding bird species in North America (Green 1995, Howe et al. 1997, Rich et al. 2004). The importance of this diversity and past concerns with potential declines of some species has led to a strong interest in monitoring forest bird populations in the region. The relatively heavily forested landscapes of northern Minnesota and Wisconsin are considered to be population 'sources' for many forest bird species and may be supplementing population 'sinks' in the agricultural landscapes of the lower Midwest (Robinson et al. 1995, Temple and Flaspohler 1998). Analysis of population trends is used as an 'early-warning system' of potential problems in a species population and serves as a measure of the ecological condition of the environment (Niemi and McDonald 2004a).

Recently, a draft of a general technical report on a summary of the twenty-plus year data that have been gathered in the Chequamegon, Chippewa, Nicolet, and Superior NFs from the late 1980s through 2011 has been completed (Niemi et al. 2015). This report has gone through several iterations of peer-review and is currently in press. It summarizes a substantial amount of information that has been gathered on population trends, habitat relationships, bird community assemblages, factors potentially affecting population trends, and considerations for bird species of concern.

Large-scale population monitoring programs such as the U.S. Geological Survey's Breeding Bird Survey (BBS) provide important information on trends at a continental scale. However, limited coverage in some areas can make it difficult to use BBS data to characterize population trends at smaller geographic scales (Peterjohn et al. 1995). Continental trends also have the potential to mask regional population trends (Holmes and Sherry 1988), thus there is a need for regional monitoring programs that can provide more localized information (Howe et al. 1997). In response to the need for regional population data, a long-term forest breeding bird monitoring program was established in 1991 in the Chippewa and Superior NFs. The Forest Service is mandated to monitor certain management indicator species (Manley et al. 1993), and our monitoring program expands beyond indicator species to include all forest songbird species that we can adequately sample. Although recent changes to the USFS Planning Rule are in the process of being implemented (USDA Forest Service 2012), we are confident that this program is an effective way of monitoring the characteristics and conditions of an important component of the ecological communities present in these NFs. Currently, more than 300 stands (> 900 points) within the two NFs are surveyed during the breeding season (June 1 to July 10).

The primary objective of this report is to update U.S. Forest Service personnel on results of the forest bird monitoring program. Here we focus on relative abundance trends of individual species during the period from 1995-2014 (20 years) and summarize the most important recent results.

DESIGN AND METHODS

Sample Design

Bird monitoring programs within NFs in northern Minnesota and Wisconsin were designed 1) to establish a baseline inventory of local breeding bird assemblages, 2) to monitor population changes of forest bird species over time, and 3) to identify bird-habitat associations, particularly those relevant to forest management activities. Originally, the monitoring program was designed for the Chequamegon NF (WI), Chippewa NF (MN), and Superior NF (MN). After the 2010 field season, the Chequamegon NF was unable to continue to fund the program. Results from the Chequamegon NF 1995-2010 and the Chippewa and Superior NFs 1995-2011 were included in the general technical report (Niemi et al. 2015)

Verner (1985) in a classic paper on bird counting techniques concluded that greater care in planning and executing counts of birds should include prior consultation with biometricians, training of personnel, and testing the bird identification skills and sensory capabilities (e.g., hearing) of field observers. Our design in the Chippewa and Superior NFs adhered to these recommendations, and has been peer-reviewed as part of national breeding bird monitoring meetings (Hanowski et al. 1995, 2002a, and 2005a) and in several peer-reviewed publications (e.g., Niemi et al. 2004, Etterson et al. 2009, and Lapin et al. 2013).

We distributed sampling locations across the forest mosaic in a proportionally stratified random manner. For each NF, stands ≥ 16 ha were grouped from their respective compartment inventories into strata defined by dominant tree species (i.e., forest cover type) and stocking density. Because the Superior NF was large, we randomly selected three of the six districts to sample (Tofte, Kawishiwi, and LaCroix). We also excluded the Boundary Waters Canoe Area Wilderness because there is no timber management and logistically the area is difficult to access. For each NF, stands were randomly selected from each stratum so the final proportion of stands was equal to the proportion of forested land area of each cover type and

stocking density for each of the NFs (Hanowski and Niemi 1995a). A total of 135 and 169 stands were originally selected in the Chippewa, and Superior NFs, respectively (Figure 1). A total of 13 habitat types were sampled in the Chippewa NF and 12 in the Superior NF (Niemi et al. 2015). Due to potential interest in logging lowland-conifer forests, twenty-five stands primarily composed of black spruce were added to the Superior NF in 2008.

Breeding Bird Counts

In 1991 we established three point locations within each stand using the guidance for point counts available at the time (Reynolds et al. 1980, Ralph and Scott 1981). Point count locations were initially located a minimum of 220 m apart and at least 100 m from the edge of the forest stand using a combination of forest inventory maps and pacing (Hanowski et al. 1990, 1996; Blake et al. 1992). Sample points were subsequently recorded using a recreation-grade GPS when the technology became available. Point counts were designed to be 10 minutes in length, conducted by trained observers (see observer training below), and completed between 0.5 hours before to 4 hours after sunrise on days with low wind (< 15 km/hr) and light or no precipitation. All counts were conducted between early to mid-June in the Superior NF, and late June to early July in the Chippewa NF. Prior to 1995, only birds recorded up to 100 m from the sample point were recorded. In 1995 we changed the protocol to include unlimited distance sampling, but continued to estimate distances within 10 m, 25 m, 50 m, 100 m, and beyond 100 m following a series of coordination workshops (Howe et al. 1997b). The number of individuals observed for each species was recorded at 0-3, 3-5, and 5-10-minute intervals. In 2010 we began to gather data at one-minute intervals after the first two minutes of sampling to gain a better understanding of bird detectability (Etterson et al. 2009). Bird counters were randomly assigned to forest stands so each counter sampled approximately the same number of stands of each forest cover type. Weather data (cloud cover, temperature, and wind speed) and time of day were recorded before each count.

Observer Training

Testing and training of counters has been an important component of the monitoring program. Prior to the field season, tapes or compact disks of 120+ bird songs were provided to all potential counters. Each counter was tested on their ability to pass an identification test of 86 bird songs. Songs on the tape were grouped by habitat (e.g., upland deciduous, lowland coniferous) to simulate field cues that would aid in song identification. A standard for number of correct responses was established by giving the test to observers who had four to five years of field experience. Based on their results, the standard for passing was set at 85% correct responses. In late May of each monitoring year observer field training was conducted over a three or four day period in either the Superior NF or in the vicinity of Duluth, Minnesota, USA. Observers conducted simultaneous practice counts at several points used in the monitoring program. Data were compiled for each observer and compared with experienced observers. In addition to field training and testing, all observers were required to have a hearing test to ensure their hearing was within normal ranges, as established by audiologists, for all frequencies (125 to 8,000 hertz).

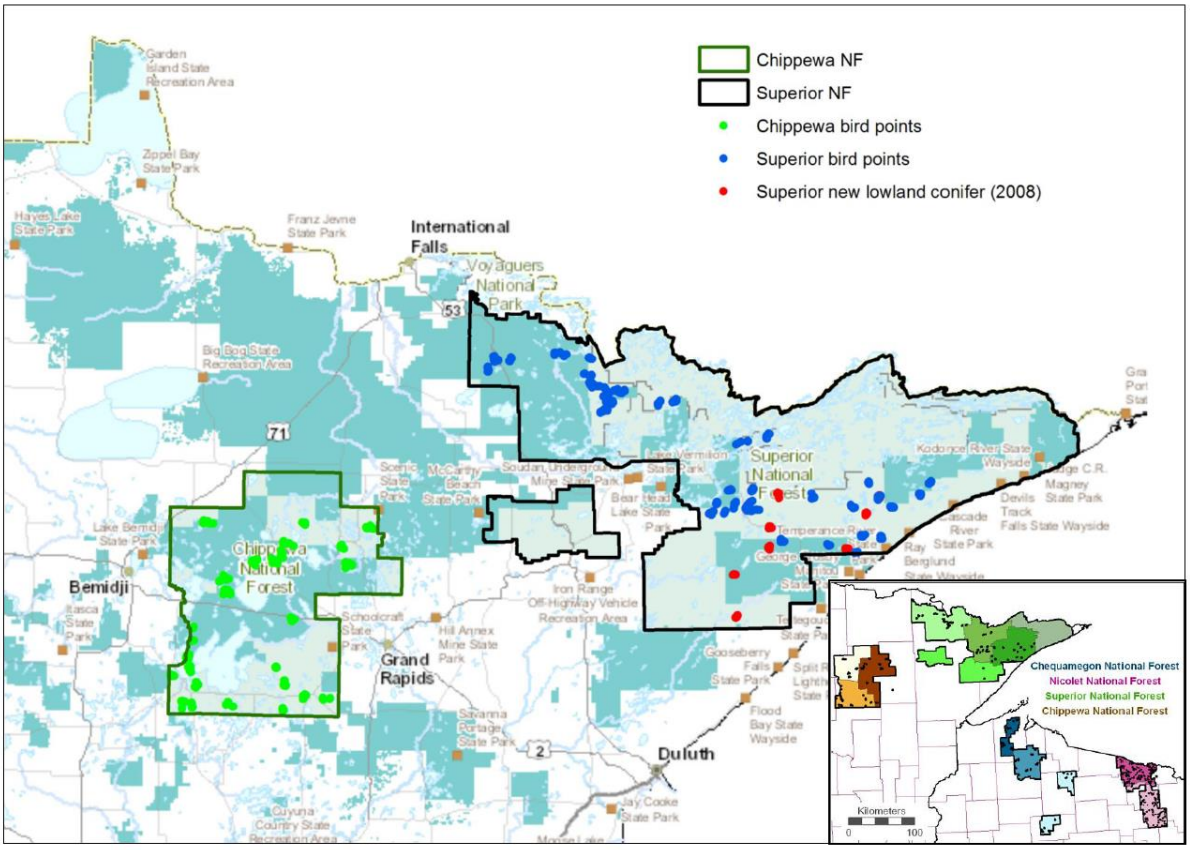

Figure 1. General locations of forest breeding bird point counts in northern Minnesota's Chippewa and Superior National Forests. Approximately 950 individual points are annually sampled between the Chippewa and Superior NFs. Inset shows the regional scope of National Forests included in Niemi et al. 2015.

Analysis

Population/abundance estimates

Bird population estimates are defined here as the annual mean number of observations of a species in a 10-minute point count for each NF and for the NFs combined. Stand-level abundance estimates for species trend analyses in the Chippewa and Superior NFs were calculated by summing the numbers of individuals across the two furthest points per stand. The middle point in each stand was excluded because an unlimited radius count from the center of the middle point sometimes overlapped areas counted on the other points. In addition, Hanowski et al. (1995) analyzed these data and determined that two points per stand were nearly equivalent in power to detect change as the use of three points per stand. The mid-point of the stand has been recorded regardless because 1) it may be used as a test point for habitat prediction modeling, 2) little time is saved by skipping the point, 3) occupancy models require a minimum of three replications in a stand (MacKenzie et al. 2006), and 4) data collected annually from the point still can be used to estimate population change. During training sessions there was an emphasis to use best judgment to avoid double counting of individual birds while sampling within a stand. Because of the change to unlimited distances, all of the trend analyses (below) were based on unlimited distance counts and were restricted to the period from 1995-2014.

We used the following criteria to help ensure that our trend analyses provided reliable population information. Stands were included in the analysis only if they had been sampled during at least six years.

Data were included for a species if it was observed at a minimum of five stands per NF and during at least three years at each stand. For species that were observed at a minimum of five stands in each of the NFs, we pooled results and carried out an additional, regional, analysis.

The implicit assumption underlying the use of point count data to estimate species-level relative abundance was that the bird species monitored have equivalent detectability within the surveys. Detectability analysis attempts to correct for species-level biases in detectability, and has been applied to bird point count data recently (Farnsworth 2002, Thompson 2002, Royale et al. 2005, MacKenzie et al. 2006, Etterson et al. 2009, Nichols et al. 2009, Sólymos et al., 2013). We applied detectability analysis to explore how our counts compared with detectability-adjusted counts for sixteen species with varying detectability using the methods of Etterson et al. (2009). Results for sixteen species that spanned the range for low-detectable species (e.g., Golden-crowned Kinglet) to highly detectable species (e.g., Ovenbird) showed that trends calculated from detectability-adjusted counts were similar to trends calculated from counts of individuals, but the most appropriate method was not apparent for cases where the two methods yielded conflicting trends. For instance, differences between methods were greatest for species with relatively small sample sizes (e.g., Brown Creeper). The primary conclusion from these detectability comparisons was that large within-year sample sizes from the same points, standardization of data gathering, and a relatively long time series resulted in trends that were similar regardless of whether counts or detectability-adjusted counts were used. Using counts unadjusted for detectability has also been supported in a critical review by Johnson (2007). For these reasons, and for the sake of simplicity, we report results using indices estimated from annual counts and have assumed that detection probabilities are constant among habitat types.

Population trajectories

A population trajectory is defined as the relative change in size of a population across years. Because we do not detect every individual bird present in our study areas, we cannot know true population size. Instead, we must assume that our sample design gives a representative index of population size for each year. We used locally weighted (LOESS) regression to smooth the time series of species relative abundance for each stand (James et al.1996). In LOESS-regression, fitted values (points along the curve) for years are calculated by giving a small amount of weight to neighboring years, for example, a year with high raw abundance for a species would tend to bring up the fitted values for the year before and the year after. We then computed the arithmetic mean and 95% confidence intervals using the fitted values from the within-stand regressions for each species in each year. The mean fitted value represents the annual index of population size and the respective confidence intervals represent the uncertainty in the estimated index. The time series of the fitted mean population index and confidence intervals graphically define a species' population trajectory.

Population trend

A population trend defines the direction and magnitude of population change over a given time period (Link and Sauer 1997). Non-linear trends notwithstanding, we view a significant trend as a unidirectional change, therefore linear methods can be used to detect a trend without asserting that the population trajectory is linear (Urquhart and Kincaid 1999). Population trends were assessed using simple linear regression applied to an annual index of population size for a study area (described above) and time. We used the slope coefficient to characterize direction and magnitude of the trend. To facilitate comparison, slopes were converted to units of percent annual change by dividing annual population indexes by the predicted value of the index at the midpoint of the entire survey period (1995 to 2043) prior to regressing the index with time (Bart et al. 2003). We assessed the significance of the regressions using a bootstrap procedure (Manly 1991) in which trends were computed for 500 bootstrap resamples of the stands used to calculate the annual population index. For each bootstrap resample, trend was calculated using the same steps as for the original trend. For each original trend, an exact p-value was calculated as the percentile at which zero occurred in the distribution of 500 bootstrapped slopes. For example, $p = 0.01$ would be equivalent to 99% of bootstrapped slopes being greater than zero, which would give us a high degree of confidence that the true

population slope was different from zero. Future analyses of trends will explore the recent approach by Sauer and Link (2011) using a hierarchical modeling approach for trend detection in the BBS.

Guild analyses

Each species was categorized within three different guild types: migration, nesting, and habitat preference (Appendix C). Information for categorizing species was obtained primarily from Ehrlich et al. (1988), Freemark and Collins (1992). Given that some species use different migration strategies, nesting substrates, and vegetation types in different portions of their geographic range, we further modified guild assignments based on personal experience with forest birds within the western Great Lakes region. All individuals of a species that were assigned to each guild were included in the same analysis described above for individual species.

Species guilds are not mutually exclusive, so the species pool in a migration guild, for example, can include many of the same species that were assigned to a nesting guild (Sauer et al. 1996). Directional trends in abundant species (e.g., Ovenbird or Red-eyed Vireo) can strongly influence the trend of the guilds in which it is a member. Given these limitations, we believe it is important to examine common patterns of change among species within a guild. If all or many species within a guild show similar trends in relative abundance, then a more thorough examination of potential stressors affecting this portion of their life histories may reveal causes of observed trends. For instance, a severe drought in the late 1980s was correlated with a decline in the population levels of many breeding bird species found in the habitat guild of aspen forests of northern Wisconsin (Blake et al. 1992).

RESULTS AND DISCUSSION

Over the course of 20 field seasons we have detected over 300,000 individual birds of 164 species on approximately 18,000 ten-minute point counts (nearly 3,000 hours of sampling) in the Chippewa and Superior NFs. In 2014, we sampled 135 stands in the Chippewa NF and 194 in the Superior NF. Seventy-three species were tested for trends in at least one national forest, including 64 in the Chippewa NF and 63 in the Superior NF (Table 1). As monitoring has proceeded through the years, new species have met our criteria for inclusion in trend analyses on each national forest. The number of tested species has increased steadily from 36 in 2000, when the criteria were first applied, to 73 in 2013 and 2014. Regional trends were calculated for 53 species between the Chippewa and Superior NFs.

Overview of Population Trends

Twenty-seven species (37%) had population trends that were significantly increasing in at least one national forest and 17 species (23%) had population trends that were significantly decreasing in at least one national forest (Table 1). Therefore, 29 species (40%) had stable or non-significant population trends among those in which we could detect a trend. There was only one conflicting trend between the Chippewa and Superior NFs in 2014; the Red-eyed Vireo was found to be increasing in the Chippewa and decreasing in the Superior. Seventeen species increased in the Chippewa NF and 18 species increased in the Superior NF. Of these, eight species increased in both NFs. These included the Black-and-White Warbler, Black-throated Green Warbler, Blue Jay, Cedar Waxwing, Nashville Warbler, Pileated Woodpecker, Pine Warbler, and Red-breasted Nuthatch (Tables 2 and 3). In contrast, seven species decreased in the Chippewa NF and 12 species decreased in the Superior NF (Table 4). Two species, Chipping Sparrow and Connecticut Warbler, decreased in both NFs. Eleven species had marginally significant trends ($0.05 < p < 0.10$), either increasing or decreasing, in either NF or regionally (Table 5).

Appendix A includes trend graphs of individual species trajectories within the Chippewa and Superior NFs. Appendix B is a complete statistical summary of the trend analysis including species, its four alphabet code, its trend within each NF, a regional trend (if possible), the significance of the trend (*P*), the explained

variation of the trend (R^2), and the number of stands (N) in which the species was detected sufficiently to include in the trend calculation. The combination of the p-value and the explained variation indicate the strength of the trend for each species within each NF. Appendix C describes the common name, scientific name, four-letter code used in field identification, and a summary of the three major guilds included here: migration strategy, nest site, and vegetation type primarily used by the species. Appendices D and E identify the number individuals observed for species not included in the trend calculations from 1995 to 2014 in the Chippewa and Superior NFs, respectively. Appendix F and G are discussed in more detail below and pertain to the additional trend analyses and power analyses completed for the Superior NF in 2014.

Chippewa National Forest

Of the 64 species tested in the Chippewa NF, 17 species (27 %) had significantly increasing trends (Table 2), seven species (11%) had significantly declining trends (Table 4), and 40 species had non-significant trend indices. Results from the 2013 annual report showed three species had significantly decreasing trends; Connecticut Warbler, Song Sparrow, and Yellow-throated Vireo, these species have shown consistent declining trends for at least three years. However, four additional species showed "new" declining trends in 2014; Chipping Sparrow, Least Flycatcher, Scarlet Tanager, and Winter Wren had new declining trends in 2014 (Appendix A).

The Connecticut Warbler has shown one of the most consistent declines for any species in the monitoring project and is discussed in more detail below as well as in Niemi et al. (2015). The Yellow-throated Vireo is a relatively uncommon species in the Chippewa NF; however, 35 forest stands were included in the analysis of its trend, potentially indicating a spatially and temporally patchy distribution in the forest (Appendix A). A declining pattern since the early 2000's is also evident for Song Sparrow, which coincides with detected declines on the BBS routes within these National Forests (Niemi et al. 2015) as well as across the boreal-hardwood transition and entire eastern United States (Sauer et al. 2014).

Superior National Forest

Of the 63 species tested in the Superior NF, 18 species (29%) had significantly increasing trends (Table 2), 12 species (19%) had significantly decreasing trends (Table 4), and 33 species had non-significant trend indices. Compared with the results through 2013, the Broad-winged Hawk, Common Loon, Connecticut Warbler, Evening Grosbeak, Swainson's Thrush, and Yellow-bellied Flycatcher continued to show declining trends through 2014, while the American Crow, Chipping Sparrow, Downy Woodpecker, Mourning Warbler, Olive-sided Flycatcher, and Red-eyed Vireo had new declining trends (Appendix A; Table1).

The declining trends in the Connecticut Warbler and Swainson's Thrush are discussed in detail in Niemi et al. (2015). These species as well as the Yellow-bellied Flycatcher and Olive-sided Flycatcher are primarily found in conifer, and especially lowland-conifer forests on the Superior NF. Twenty-five stands in lowland conifer forests were added to the Superior NF in 2008 and have been consistently sampled for seven years (Figure 1). We performed a comprehensive analysis of how the inclusion of these new stands affects forest bird trends (Appendix F). The effects of including the new stands on trend analysis were most apparent in species that either utilize lowland conifer habitat (e.g. Ruby-crowned Kinglet) or avoid lowland conifer habitat (e.g. deciduous-forest species). Species that breed in lowland conifer had an increase in annual indices starting in 2008 because a higher proportion of the stands available for trend analysis were of their preferred habitat. Incorporating the new lowland conifer stands influences the trend analysis and because these stands have only been sampled for seven of the 20 years of monitoring, the results can be difficult to interpret. For example, without the new stands, the Yellow-bellied flycatcher showed a significant population decline, whereas this trend was non-significant when the new stands of this species' preferred habitat were included (Appendix F). We expect this effect to become diluted as additional sampling years

are included in analysis. With the exception of Appendix F, we did not include the new stands in 2014 analyses.

The Evening Grosbeak has been declining over a large area of the northern U.S. and Canada. Potential reasons associated with the widespread decline include disease transmitted at bird feeders, reduced food supplies due to logging of hardwood forests in Canada (its primary breeding area), and changes in its breeding and wintering distribution due to shifting climatic conditions (Niemi 2012). Local population trends have been shown to track spruce budworm outbreaks (Gillihan and Byers 2001). The most recent widespread outbreak occurred just before monitoring began (Niemi et al. 2015), potentially augmenting populations and forming the starting point for a decline in this species. However, trends for two spruce-budworm specialists the Cape May Warbler and Tennessee Warbler have shown population increases (Appendix A), indicating a budworm outbreak in the region (Sturtevant et al. 2013). The declining trends of the Common Loon, Downy Woodpecker and Broad-winged Hawk should be viewed with caution unless substantiated with other data. The point count methodology may not be the best survey technique for these species, plus the sample sizes are small for the Downy woodpecker and Broad-winged Hawk.

Pooled National Forests

We calculated a regional trend between the Chippewa and Superior NFs for 53 species in 2014. Seventeen species (32%) were increasing significantly (Table 2) and eight species (15%) were decreasing significantly (Table 4). The Chipping Sparrow, Connecticut Warbler, Song Sparrow, and Yellow-bellied Flycatcher all showed highly significant region-wide declines ($p < 0.01$). The latter two species, as well as the Scarlet Tanager, also showed declining region-wide trends across the four NFs included in Niemi et al. (2015) (Chippewa, Superior, Chequamegon and Nicolet). The Connecticut Warbler was not common enough to warrant analysis across these Western Great Lakes NFs. Additional species that had regional declines included the Common Loon, Downy Woodpecker, and Mourning Warbler.

Results from local BBS routes (overlapping the NFs), the Song Sparrow showed a decline, while the Yellow-bellied Flycatcher had an increasing trend (Niemi et al. 2015). This example is indicative of the differences between the two monitoring projects, especially in sample size and the habitat context of on versus off-road counts. The agreement of results for Song Sparrows might relate to this species' use of open and shrubby habitats often characteristic of roadsides in northern Minnesota and hence surveyed by the BBS. Conversely, the Yellow-bellied Flycatcher, along with many other forest-species, is best monitored using off-road, habitat-specific counts (Hanowski and Niemi 1995b). Contrary results between this program and the BBS point to the importance of monitoring bird populations at different landscape scales (Niemi et al. 2015). The primary strengths of the BBS program are its long time-frame (1966-present) and broad geographical context. To better understand conservation needs for Minnesota's breeding birds, it is important to study local e.g. NF-level, as well as regional populations e.g. boreal-hardwood transition; Partners in Flight Bird Conservation Region 12 (BCR 12).

Management Activities on Study Areas

Of the survey sites in the two national forests, 20.9% have been at least partially harvested since the beginning of monitoring in 1991, which is about 1% per year. Over the first 12 years of monitoring an average of 1.2% of sampled sites were harvested each year, whereas in the most recent 11 years of monitoring 0.7% of sampled sites were harvested per year. The overall harvest rate is comparable to the 4.8% change from mature forest to early-successional types on federally managed forest lands in northeastern Minnesota between 1990 and 1995 (i.e. ~1% annual change; Wolter and White 2002). Additionally, the trend towards lower harvest levels in recent years is compatible with NF-wide trends (Niemi et al. 2015). Thus, it appears that management activities on our sample sites have continued to be representative of these two national forests.

Guild Analyses

At both the NF-level and regional scale, nearly all migratory, nesting, and habitat association guilds showed significant increases from 1995-2014 (Table 6). Notable exceptions were species associated with early-successional forests and shrub/sub-canopy nesting species within both NFs and regionally. This parallels the reduction in logging that has occurred in these two NFs over the past 10 years as documented in Niemi et al. (2015). Among the guilds included in the analysis, one would expect that breeding bird species associated with early-successional forests would be those most affected by a reduction in logging activity. Several species associated with open areas and early-successional habitats had apparent declines including the Chipping Sparrow, Mourning Warbler, and Song Sparrow. These species also had widespread declines across BCR 12 (Sauer et al. 2014) and the two former species were recently found to be most indicative of managed habitats in the Superior NF (Zlonis and Niemi 2014). Maturation of forests across the region in conjunction with an increase in forested lands (MFRC 2013) might contribute to these declines due to loss of breeding habitat. Still, many early-successional species had stable or increasing trends over the period 1995-2014. Species such as the Chestnut-sided Warbler probably find an abundance of adequate habitat in tree-fall gaps that develop as forests age beyond standard harvest intervals (Zlonis and Niemi 2014).

There were no guilds that had significantly decreasing trends. A continued noteworthy pattern; however, are the trends among the migratory guilds. Permanent residents continue to show the greatest overall percentage increase over the past 20 years with an increase of 1.9% per year within both the Chippewa and Superior NFs (Table 6). Both short-distance migrants and long-distance migrants have also had increasing trends but not as high as the permanent residents (Table 6). Note that a 1.9% per year increase over a 20-year period represents a nearly 50% increase in the number of permanent resident individuals within these two NFs in 2014 compared with 1995.

The possible hypotheses why permanent residents may be increasing at a greater rate than the short and long distance migrants include the following. (1) Over-winter survival has increased for permanent residents because the climate is warming and winters are less severe in terms of temperature. (2) Nest success has increased due to increased access to snags and cavities present from decreased logging and changing silvicultural practices. (3) Winter feeding of birds has been increasing over the past 20 years and supplemental food aids in over-winter survival. (4) Climatic warming results in earlier emergence of food (insects, berries, buds, etc.) and, hence, the earlier nesting species such as permanent residents would gain the greatest benefit from this shift in phenology. These hypotheses are not mutually exclusive, but some of the data presented in the recent general technical report on climate patterns over the period 1995-2011 suggests some support for hypotheses 1 and 4 (Niemi et al. 2015). However, it is noteworthy that recent cold winters and springs in 2012-2013 and 2013-2014 may have an effect on permanent residents because they have declined especially in the past two years (Appendix A).

Power Analysis

A principle goal of the Forest Bird Monitoring project is to detect population change for breeding bird species in Minnesota's NFs. However, the extent to which our sampling design and sample size are able to detect change has not been recently analyzed (*but see* Hanowski et al. 1995). Superior NF biologists expressed interest in understanding the statistical power of the project to detect population change under a variety of scenarios involving specific species, habitats, and modifications to sampling intensity. They outlined several key questions regarding this analysis in spring, 2014 (Appendix G; 'Questions_PowerAnalysis').

Statistical power, or the probability of correctly rejecting the null hypothesis, varies depending on sample size, attributes of the response variable, and the effect size of interest. Negative binomial generalized linear mixed models were fit for each species and scenario, identifying the sampling proportion needed to have power of 0.80 to detect either a 20% or 50% population change over a 10-year period (Appendix G).

Generally, power ≥0.80 has been used to identify a satisfactory sampling protocol (Steidl et al. 1997) i.e. an 80% or greater chance of identifying an effect, or population trend in this case, given one exists.

As expected, power had a strong positive relationship to the relative abundance of any given bird species (Appendix G). For example, sampling could be reduced by as much as 80%, while still having a power of 0.80 to detect a 20% population change in 10 years for the Ovenbird (1,082 observations/year). On the other hand, it appears that current sampling levels are not adequate to reliably detect population change (20 or 50%) for uncommon species e.g. the Pine Warbler (22 observations/year). Results were more equivocal for species with moderate abundance. Currently these results, as well as those of possible sampling scenarios, are being interpreted and will be summarized in a forthcoming manuscript. We are investigating additional analyses involving the number of sampling points being utilized per stand, the development of confidence intervals on power estimates, and alternative effect sizes.

CONCLUSIONS

The delayed spring in 2013 likely contributed to poor nesting success for many forest birds, as indicated by the large decrease in total abundance of breeding birds counted in 2014 (Figure 2) and lower abundance estimates for all migratory guilds (Appendix A; Table 6). In addition, several new declining trends were identified (Table 4). We expect this trend to continue in 2015 after another late spring in 2014 was followed by cool weather and heavy rain events in June. Still, most species for which we can detect trends show a stable or increasing pattern over the period 1995-2014.

There are several possible hypotheses on why so many species seem to be stable or increasing in relative abundance over the past 20 years. First, and most apparent, logging activity has steadily decreased in both the Chippewa and Superior NFs over the past ten years; primarily due to the economic downturn of the recent recession and other factors that have contributed to reduced demand for lumber, paper, and other forest products. This has led to several potentially important changes to the age structure of forests. Over the period 1977-2012, northeastern Minnesota has seen an increase in the proportion of forest that is greater than 60 years old and a concurrent decrease in mid-successional forests of 41-60 years old (MFRC 2013). Therefore, the amount of forest in early successional age-classes (0-20 years) has either remained stable or increased slightly. Because the majority of breeding bird species in these forests relates to either early or late successional forests, it is logical that nearly all species would also be stable or increasing. Older forests, especially those with diverse structural elements, support a much broader range of species including early successional species (Helle and Niemi 1996, Schieck and Song 2006). Aspen forests provide an excellent example of how this structural diversity develops; stands >60 years old have 2-3 times higher natural mortality than those that are 41-60 years old (MFRC 2013), thus providing a variety of habitat elements from snags that increase nest-cavities to tree-fall gaps that create shrubby growth utilized by many species.

Silvicultural practices have also changed over the last 20 years. Although about 70% of harvesting is completed through clear-cutting, this has steadily decreased from 1991-2008 with selection harvesting, thinning, and patch clear-cuts being utilized more often (D'Amato et al. 2009). Over the same period, there has been a nearly two-fold increase in the number of clear-cuts (44% in 1991 to 80% in 2008) that incorporate leave trees (D'Amato et al. 2008). With logging being the most significant disturbance on these NFs, changes in practice have a variety of effects on both local and regional populations of birds. This is especially true if modifications (e.g. leaving standing timber and snags in clear-cuts) mimic disturbance features that these species evolved to utilize. Changing age-class structure and silvicultural practices might better represent the natural fire disturbance regime that once dominated these forests (Heinselman 1973; Niemi et al. 1998) and to which most of these bird species certainly respond.

Despite increasing mature forest cover, several of the species that are decreasing breed primarily in mid-to-late-successional forests including the Broad-winged Hawk, Connecticut Warbler, Evening Grosbeak,

Swainson's Thrush, and Yellow-bellied Flycatcher. For each, there are potential reasons for these trends. First, these species, with the exception of the Broad-winged Hawk, have mostly boreal distributions and are at or near the edge of their breeding range in these NF's. This is where we might expect initial declines to be most evident, especially if changing climatological factors are influencing these species' populations. The Connecticut Warbler, Swainson's Thrush, and Yellow-bellied Flycatcher are all highly associated with lowland coniferous forests, which have different logging and management pressures than upland forests. These species also share similar food types and foraging-space in dense, shrubby growth near the ground (Pitocchelli et al. 1997; Evans-Mack and Yong 2000; Gross and Lowther 2001). There is some evidence that drought conditions and lower food supplies over the past ten years may have affected reproduction for these species that rely on an insectivorous diet to feed their young (Niemi et al. 2015). The declining trend of the Broad-winged Hawk (5 stands – the minimum for inclusion) is based on relatively sparse data and is contrary to recent analyses that show a stable trend in migration numbers past Hawk Ridge Bird Observatory (*R. Regal unpublished data*). Though difficult to characterize, the decline in Evening Grosbeak is relatively clear throughout North America (Sauer et al. 2014).

Among the major conclusions of the 20-year summary of the national forest bird monitoring program (Niemi et al. 2015) is our inability to definitively pinpoint specific causes of increases or decreases in trends of specific species. Because these species range over relatively wide areas these populations are subject to many potential factors that can affect their population. These factors include climate, weather, diseases, landscape and habitat change due to both natural and anthropogenic disturbances (e.g., forest fire, logging, wind, exurban development and insect defoliation). Hazards of migration (Loss et al. 2014) and over-wintering conditions (Norris et al. 2004) can also influence population levels. We plan to explore two analyses that may shed light on how these factors might be affecting species' populations; an analysis of the important factors influencing trend numbers and a re-examination of the trend analysis with a Bayesian hierarchical framework similar to that conducted for the BBS (Sauer and Link 2011). Nevertheless, given the number of species that we are able to monitor, if there is an influence of a large-scale forest management activity, it is likely that such a signal would be detected by these data. In fact, the clearest signal we may have is reflected in the large number of species that are increasing or are stable; possibly due to the reduction in logging activity in these forests, associated changes in age-class structure across the landscape, as well as the annual changes in ambient weather conditions.

Detailed studies and conservation action are needed for species that have dramatic declines such as the Connecticut Warbler. In the last 20 years, we have detected a more than 80% population decline in Minnesota NFs for this species, which parallels range-wide declines in BBS data (Sauer et al. 2014). It was also acknowledged as part of the 'Yellow Watch List' in the most recent State of the Birds report (Rosenberg et al. 2014). With a large portion of its population in the western part of BCR 12 (Ruth 2006), Minnesota is an important location for both research and conservation of the Connecticut Warbler. Similar at-risk species, such as the Golden-winged Warbler are receiving much needed attention (Pfannmuller 2012, Buehler et al. 2007). Little is known about the Connecticut Warbler, though two recent analyses of habitat associations have provided information on breeding habitat in Minnesota (Lapin et al. 2013, Zlonis et al. *in prep.*). To identify causes for the decline, future study must address detailed demographic information, as well as full life-cycle analysis.

The overall message in this report is positive regarding breeding forest birds in the Chippewa and Superior NFs. Although there is evidence of positive trends in forest-cover across the region (+5.5% in last 35 years; MFRC 2013), from a historical perspective, most of these forest-associated breeding species likely have much lower populations today than in the past due to habitat loss. For example, Minnesota has lost almost half of its forest area from 31 million acres in the mid-1800's to less than 17 million acres today. These rates of forest loss are conservative relative to other U.S. states and in over-wintering habitats of Mexico and in Central and South America. Maintaining adequate forested habitat across these species' ranges and identifying the factors influencing their populations will be major challenges for many generations to come.

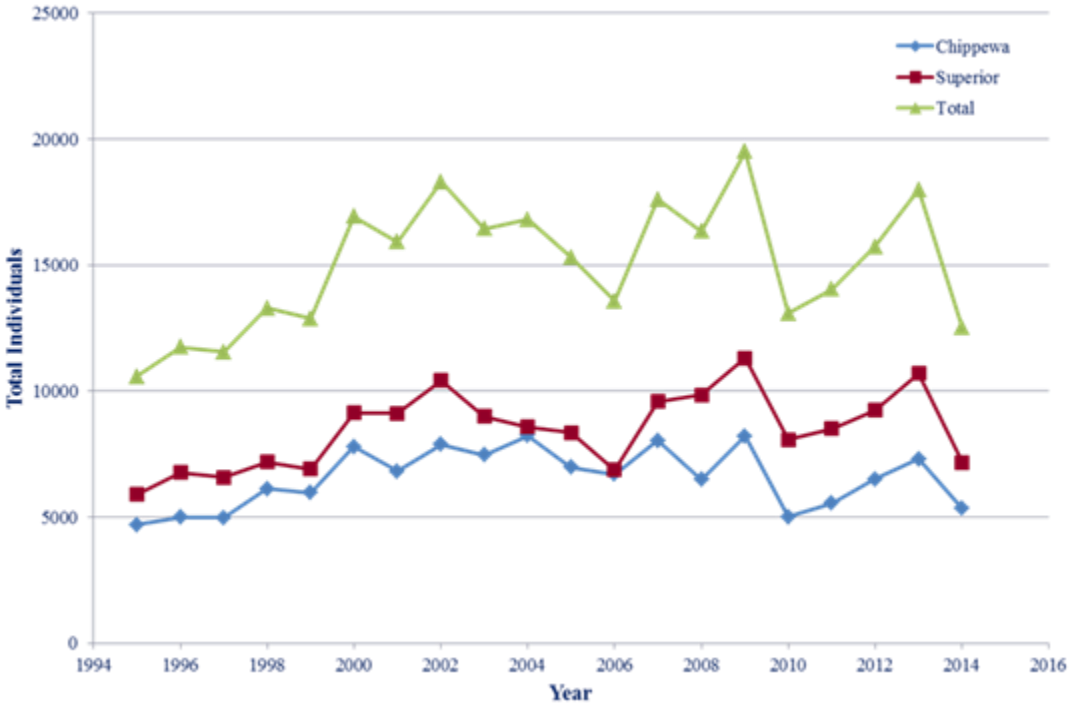

Figure 2. Total number of individual birds detected each year in the Chippewa and Superior NFs. Note that birds detected at 25 stands added to the Superior NF in 2008 are included, causing the slightly increased discrepancy between the two NFs from 2008-2014.

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Tables

Table 1. Trends for two National Forests (NF) and pooled NF's based on linear regression of loess-smoothed annual index of abundance (See Methods) (1995- 2014). I= significantly increasing, D= significantly decreasing. *$P \leq 0.05$, ** $P \leq 0.01$. See Appendix A for species graphs and Appendix B for test statistics and sample sizes.

	Chippewa NF	Superior NF	Regional
Alder Flycatcher	ns	ns	ns
American Crow	ns	D**	ns
American Goldfinch	I**	ns	I**
American Redstart	ns	ns	ns
American Robin	ns	I**	I**
Black-and-white Warbler	I**	I**	I**
Blackburnian Warbler	ns	ns	ns
Black-billed Cuckoo	-	ns	-
Black-capped Chickadee	ns	I*	I**
Black-throated Blue Warbler	-	ns	-
Black-throated Green Warbler	I**	I**	I**
Blue Jay	I*	I**	I**
Blue-headed Vireo	ns	ns	ns
Broad-winged Hawk	-	D*	-
Brown Creeper	ns	ns	ns
Brown-headed Cowbird	ns	-	-
Canada Warbler	I*	ns	ns
Cape May Warbler	-	I**	-
Cedar Waxwing	I*	I*	I**
Chestnut-sided Warbler	ns	ns	ns
Chipping Sparrow	D**	D*	D**
Common Loon	ns	D**	D*

Common Raven	ns	ns	ns
Common Yellowthroat	ns	ns	ns
Connecticut Warbler	D**	D**	D**
Downy Woodpecker	ns	D*	D*
Eastern Wood-Pewee	ns	ns	ns
Evening Grosbeak	-	D**	-
Golden-crowned Kinglet	ns	I**	I**
Golden-winged Warbler	ns	ns	ns
Gray Catbird	ns	-	-
Gray Jay	ns	I*	ns
Great Crested Flycatcher	ns	-	-
Hairy Woodpecker	ns	ns	ns
Hermit Thrush	I**	ns	ns
Indigo Bunting	ns	-	-
Least Flycatcher	D*	ns	ns
Magnolia Warbler	ns	ns	ns
Mourning Dove	I**	-	-
Mourning Warbler	ns	D*	D*
Nashville Warbler	I**	I**	I**
Northern Flicker (Yellow-shafted)	ns	ns	ns
Northern Parula	ns	I**	I**
Northern Waterthrush	ns	ns	ns
Olive-sided Flycatcher	ns	D*	ns
Ovenbird	I**	ns	I**
Palm Warbler (Western)	ns	-	-
Pileated Woodpecker	I**	I*	I**
Pine Warbler	I**	I**	I**
Purple Finch	ns	ns	ns
Red-breasted Nuthatch	I**	I**	I**
Red-eyed Vireo	I*	D**	ns

Red-winged Blackbird	ns	ns	ns
Rose-breasted Grosbeak	ns	ns	ns
Ruby-crowned Kinglet	-	I**	-
Ruby-throated Hummingbird	ns	-	-
Ruffed Grouse	-	ns	-
Scarlet Tanager	D*	ns	D*
Song Sparrow	D**	ns	D**
Swainson's Thrush	-	D**	-
Swamp Sparrow	ns	ns	ns
Tennessee Warbler	-	I**	-
Veery	I**	ns	ns
White-breasted Nuthatch	ns	-	-
White-throated Sparrow	ns	I**	I**
Wilson's Snipe	ns	ns	-
Winter Wren	D**	ns	ns
Wood Thrush	I*	ns	ns
Yellow Warbler	ns	-	-
Yellow-bellied Flycatcher	ns	D**	D**
Yellow-bellied Sapsucker	I**	ns	I**
Yellow-rumped Warbler (Myrtle)	ns	I**	I**
Yellow-throated Vireo	D**	-	-

Table 2. Species with significantly increasing trends ($P \leq 0.05$) for two National Forests and region-wide (1995-2014), based on regression of loess-smoothed annual index of abundance. **$P \leq 0.01$. Species graphs can be found in Appendix A.

Chippewa NF	Superior NF	Regional
American Goldfinch**	American Robin**	American Goldfinch**
Black-and-white Warbler**	Black-and-white Warbler**	American Robin**
Black-throated Green Warbler**	Black-capped Chickadee	Black-and-white Warbler**
Blue Jay	Black-throated Green Warbler**	Black-capped Chickadee**
Canada Warbler	Blue Jay**	Black-throated Green Warbler**
Cedar Waxwing	Cape May Warbler**	Blue Jay**
Hermit Thrush**	Cedar Waxwing	Cedar Waxwing**
Mourning Dove	Golden-crowned Kinglet**	Golden-crowned Kinglet**
Nashville Warbler**	Gray Jay	Nashville Warbler**
Ovenbird**	Nashville Warbler**	Northern Parula**
Pileated Woodpecker**	Northern Parula**	Ovenbird**
Pine Warbler**	Pileated Woodpecker	Pileated Woodpecker**
Red-breasted Nuthatch**	Pine Warbler**	Pine Warbler**
Red-eyed Vireo	Red-breasted Nuthatch**	Red-breasted Nuthatch**
Veery**	Ruby-crowned Kinglet**	White-throated Sparrow**
Wood Thrush	Tennessee Warbler**	Yellow-bellied Sapsucker**
Yellow-bellied Sapsucker**	White-throated Sparrow**	Yellow-rumped Warbler (Myrtle)**
	Yellow-rumped Warbler (Myrtle)**	

Table 3. Summary of species with increasing trends ($P \leq 0.05$) on two National Forests (1995-2014). Individual species graphs can be found in Appendix A.

Increased in one NF	**Increased in both NFs**
American Goldfinch	Black-and-white Warbler
American Robin	Black-throated Green Warbler
Black-capped Chickadee	Blue Jay
Canada Warbler	Cedar Waxwing
Cape May Warbler	Nashville Warbler
Golden-crowned Kinglet	Pileated Woodpecker
Gray Jay	Pine Warbler
Hermit Thrush	Red-breasted Nuthatch
Mourning Dove	
Northern Parula	
Ovenbird	
Red-eyed Vireo	
Ruby-crowned Kinglet	
Tennessee Warbler	
Veery	
White-throated Sparrow	
Wood Thrush	
Yellow-rumped Warbler (Myrtle)	
Yellow-bellied Sapsucker	

Table 4. Species with significantly decreasing trends ($P < 0.05$) for two National Forests (1995-2014), based on regression of loess-smoothed annual index of abundance. $^{**}P < 0.01$. Species graphs can be found in Appendix A.

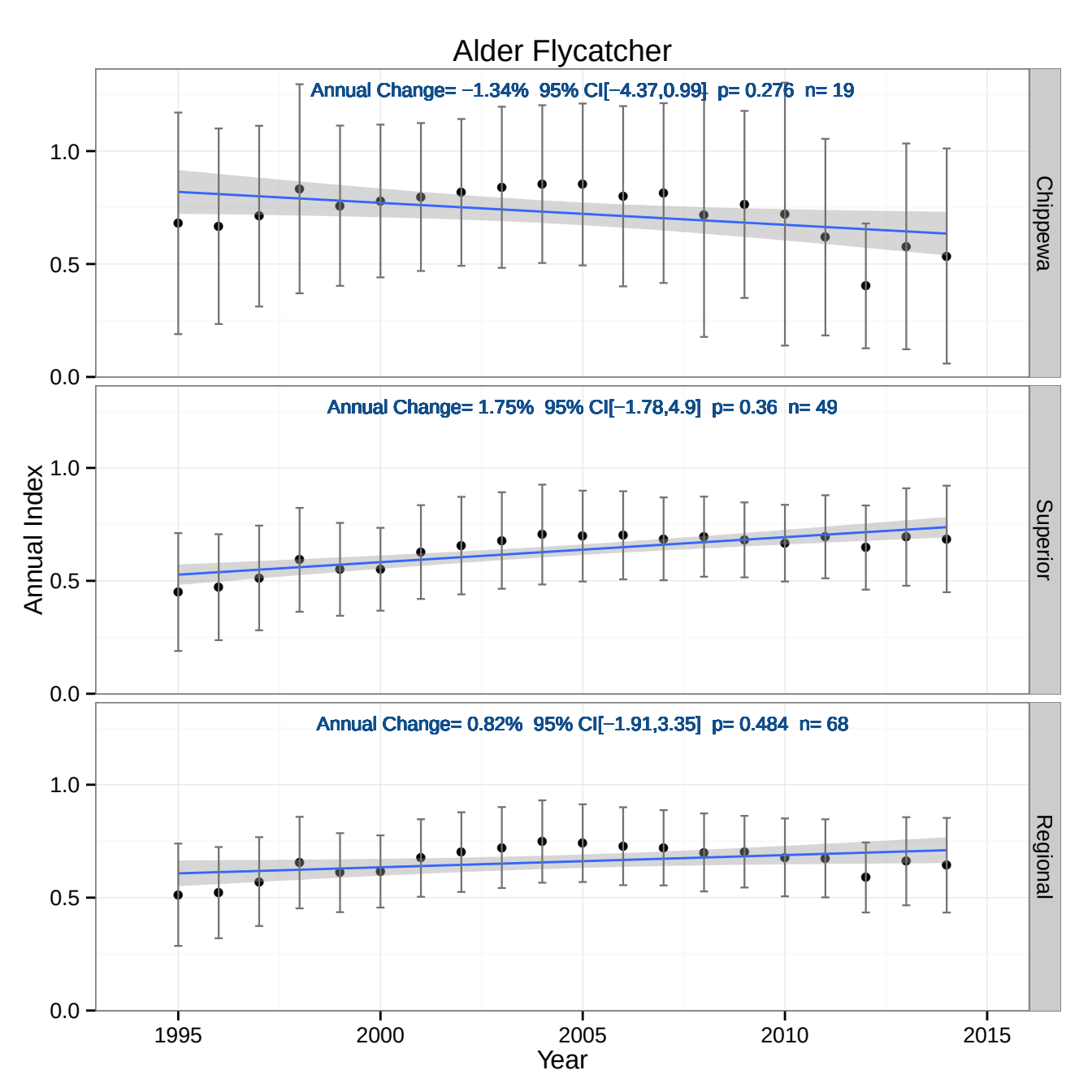
Chippewa NF	Superior NF	Regional
Chipping Sparrow**	American Crow**	Chipping Sparrow**
Connecticut Warbler**	Broad-winged Hawk	Common Loon
Least Flycatcher	Chipping Sparrow	Connecticut Warbler**
Scarlet Tanager	Common Loon**	Downy Woodpecker
Song Sparrow**	Connecticut Warbler**	Mourning Warbler
Winter Wren**	Downy Woodpecker	Scarlet Tanager
Yellow-throated Vireo**	Evening Grosbeak**	Song Sparrow**
	Mourning Warbler	Yellow-bellied Flycatcher**
	Olive-sided Flycatcher	
	Red-eyed Vireo**	
	Swainson's Thrush**	
	Yellow-bellied Flycatcher**	

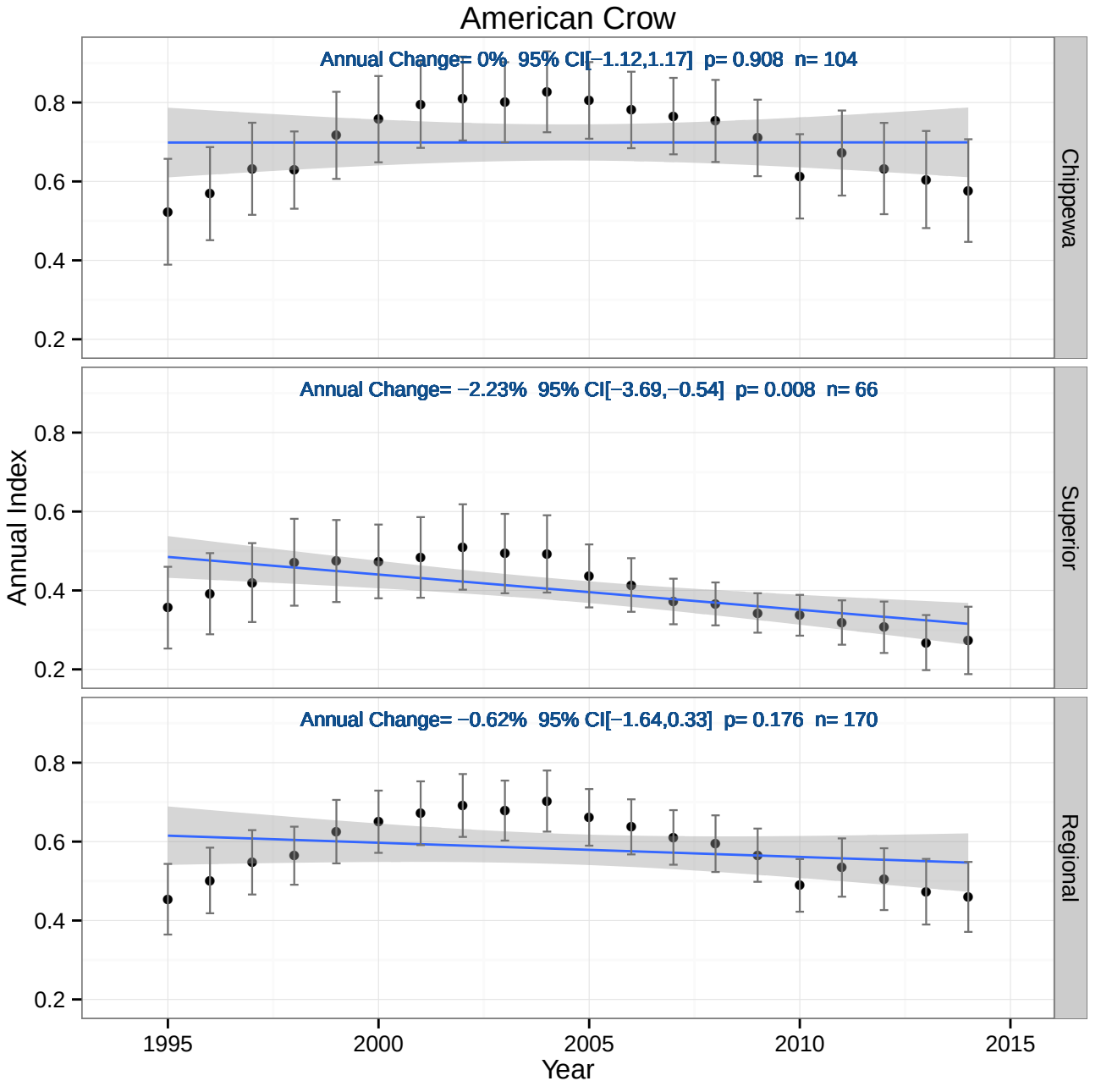
Table 5. Species with marginally significantly increasing trends ($0.05 < P \leq 0.10$) for two National Forests and region-wide (1995-2014), based on regression of loess-smoothed annual index of abundance. Direction of trend indicated by either positive (+) or negative-sign (-). Species graphs can be found in Appendix A.

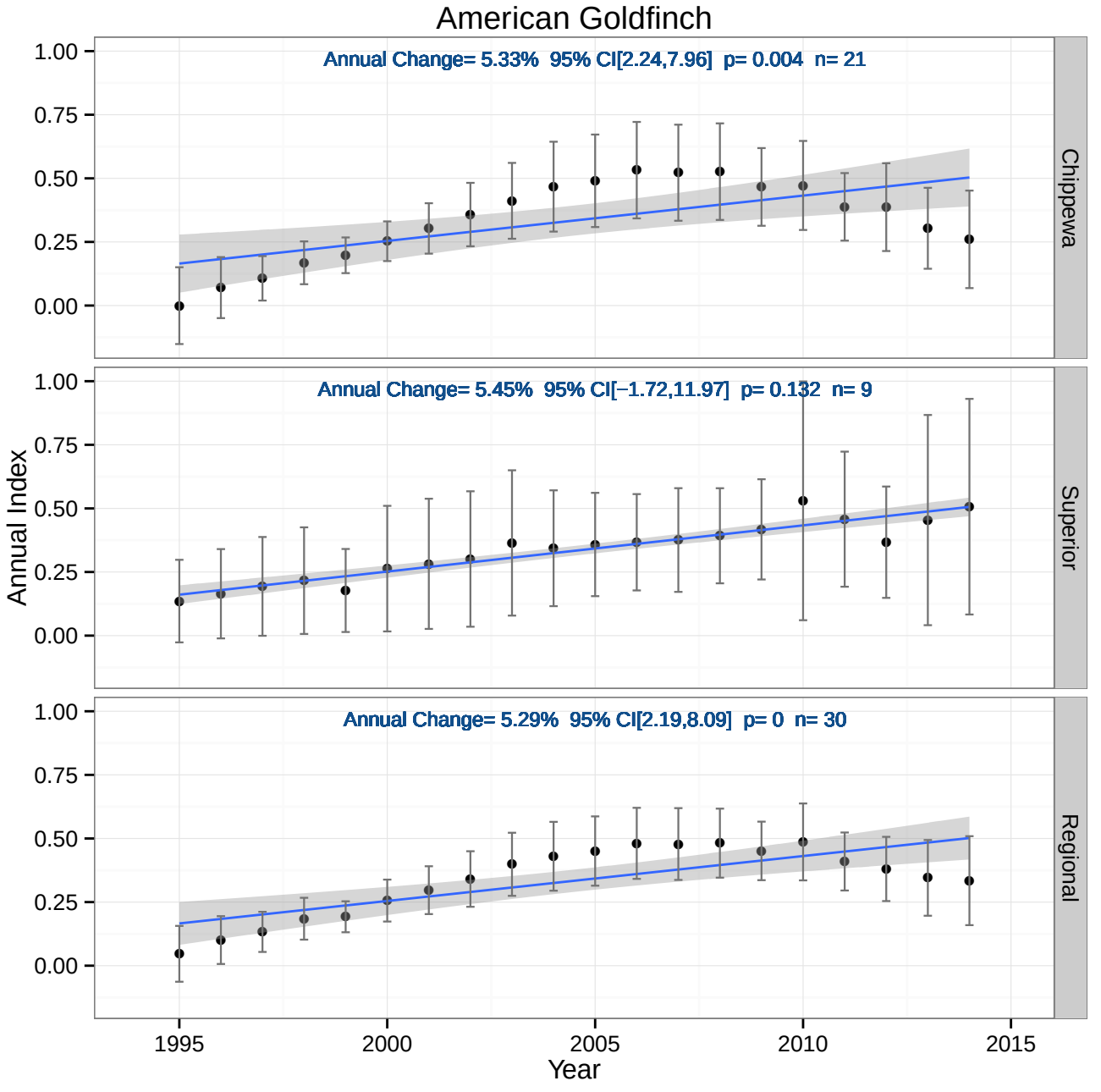
Chippewa NF	Superior NF	Regional
Eastern Wood-Pewee (-)	Song Sparrow (-)	Eastern Wood-Pewee (-)
Northern Parula (+)		Gray Jay (+)
White-throated Sparrow (+)		Hairy Woodpecker (+)
Wilson's Snipe (+)		Hermit Thrush (+)
		Olive-sided Flycatcher (-)
		Red-eyed Vireo (-)
		Winter Wren (-)

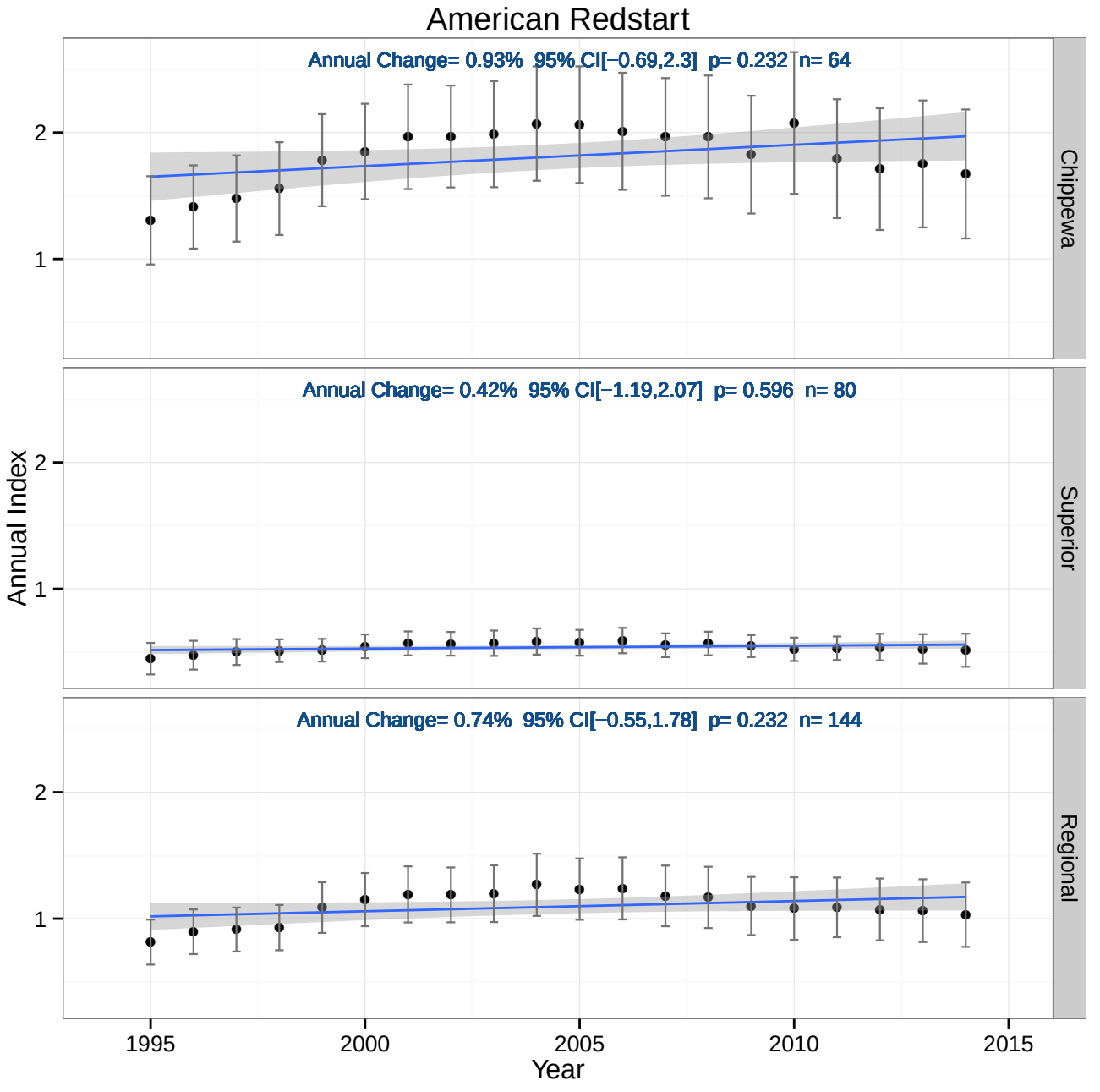
Table 6. Test statistics and sample sizes for guild trend analyses on two National Forests and a combined regional analysis (1995-2014). All species combined within each guild category and analyzed as a group, regardless of whether a species meets criteria for individual species analyses. Trend= percent annual change in population trend. N= number of stands analyzed. See appendix A for trend graphs.

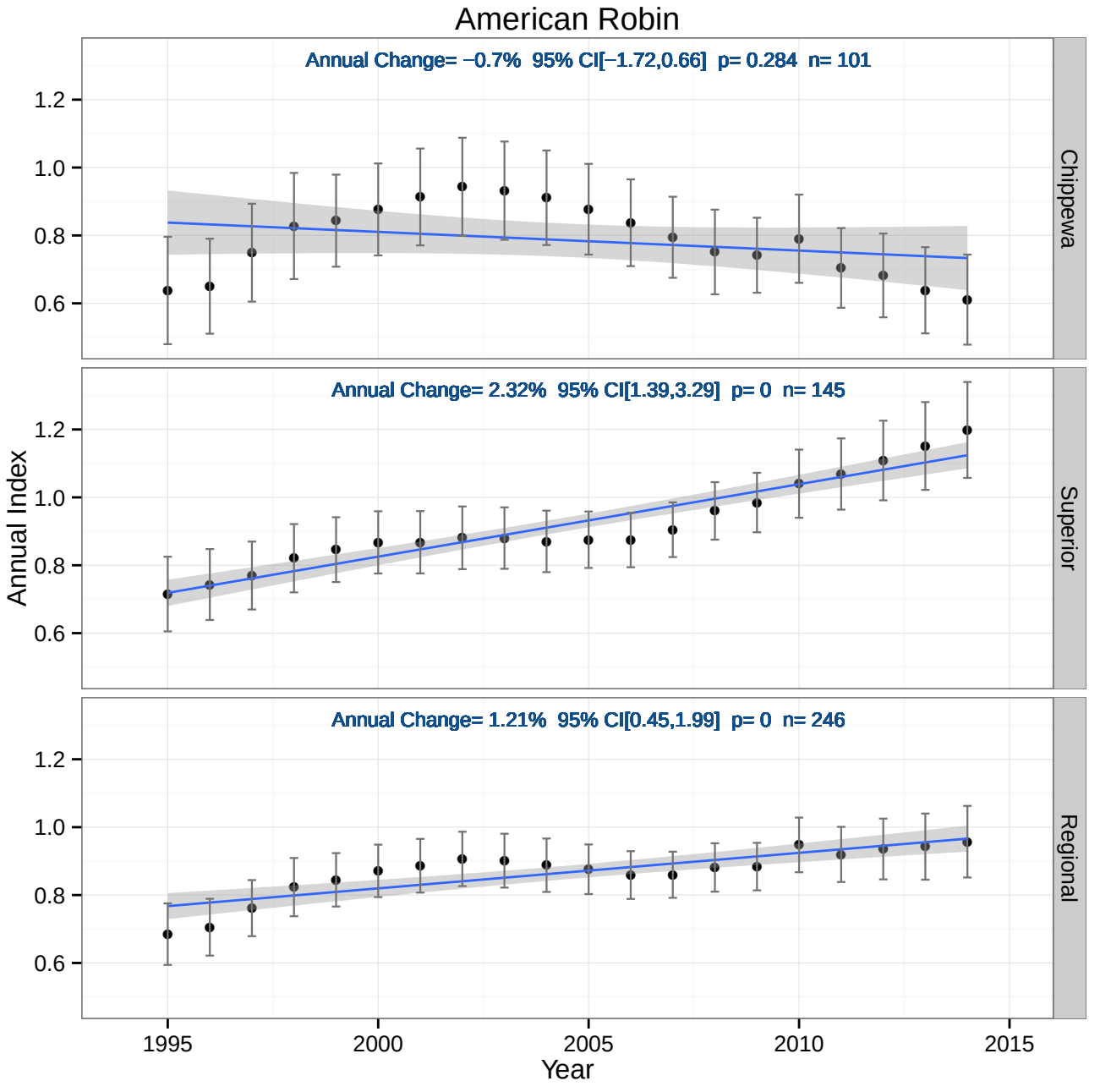
	Chippewa NF				**Superior NF**				**Regional**			
Guild Category	Trend	*P*	R^2	N	Trend	*P*	R^2	N	Trend	*P*	R^2	N
Short distance migrants	0.17	0.44	0.01	126	1.17	<0.01	0.49	147	0.73	<0.01	0.20	273
Long distance migrants	0.74	<0.01	0.17	126	0.19	0.04	0.02	147	0.44	<0.01	0.08	273
Permanent residents	1.58	<0.01	0.32	126	2.15	<0.01	0.65	147	1.90	<0.01	0.50	273
Ground nesting	1. 1.06	<0.01	0.43	126	0.40	<0.01	0.08	147	0.67	<0.01	0.22	273
Shrub/Sub-canopy nesting	0.01	0.99	0.00	126	-0.01	0.95	0.00	147	-0.01	0.96	0.00	273
Canopy nesting	0.52	0.01	0.10	126	2.01	<0.01	0.97	147	1.26	<0.01	0.62	273
Cavity nesting	1.84	<0.01	0.34	126	1.76	<0.01	0.28	147	1.80	<0.01	0.30	273
Coniferous forest	1.24	<0.01	0.42	123	1.91	<0.01	0.93	147	1.63	<0.01	0.78	270
Lowland coniferous	1.00	<0.01	0.61	119	0.83	<0.01	0.35	147	0.90	<0.01	0.57	266
Deciduous forest	0.75	<0.01	0.12	126	0.11	0.41	0.00	147	0.43	<0.01	0.05	273
Early-succession	0.15	0.69	0.00	125	0.24	0.48	0.02	147	0.21	0.52	0.01	272
Mixed forest	1.75	0.00	0.72	126	1.05	<0.01	0.59	147	1.37	<0.01	0.68	273

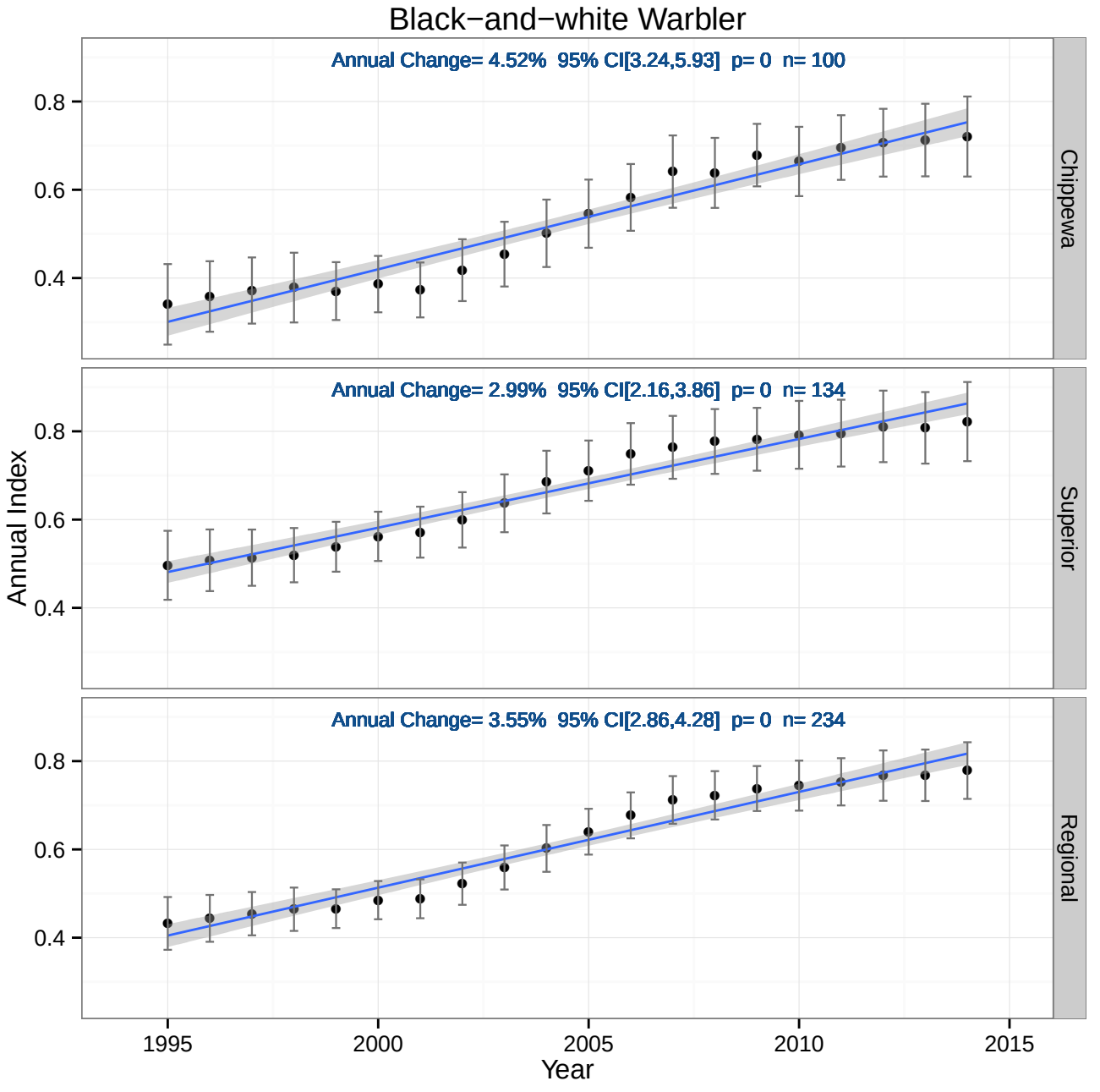

Alder Flycatcher
Annual Change= −1.34% 95% CI[−4.37,0.99] p= 0.276 n= 19
Annual Change= 1.75% 95% CI[−1.78,4.9] p= 0.36 n= 49
Annual Change= 0.82% 95% CI[−1.91,3.35] p= 0.484 n= 68
Chippewa
Superior
Regional
Annual Index
Year
0.0
0.5
1.0
1995
2000
2005
2010
2015

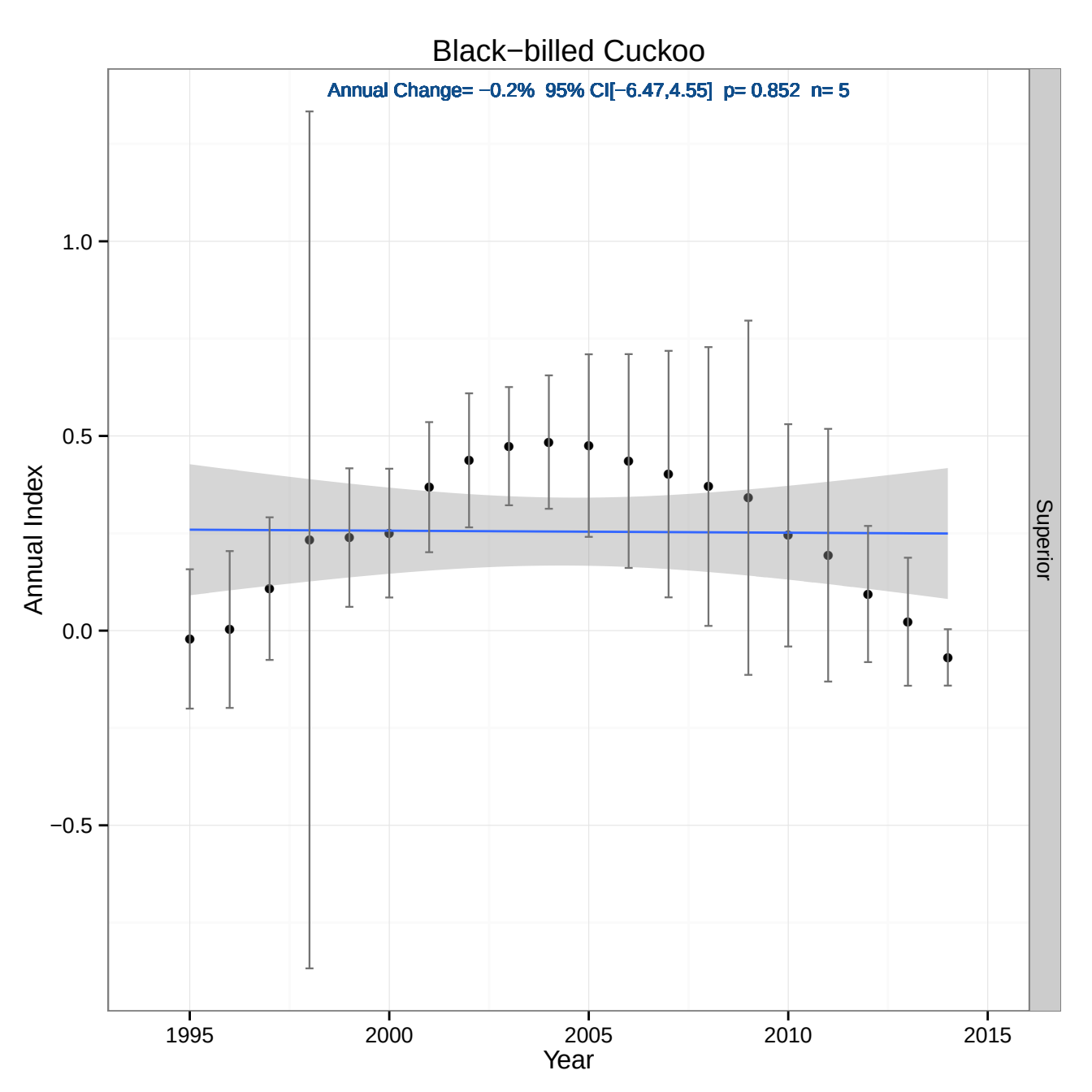

American Crow
Annual Change= 0% 95% CI[−1.12,1.17] p= 0.908 n= 104
Annual Change= −2.23% 95% CI[−3.69,−0.54] p= 0.008 n= 66
Annual Change= −0.62% 95% CI[−1.64,0.33] p= 0.176 n= 170
Chippewa
Superior
Regional
Annual Index
Year
0.2
0.4
0.6
0.8
1995
2000
2005
2010
2015

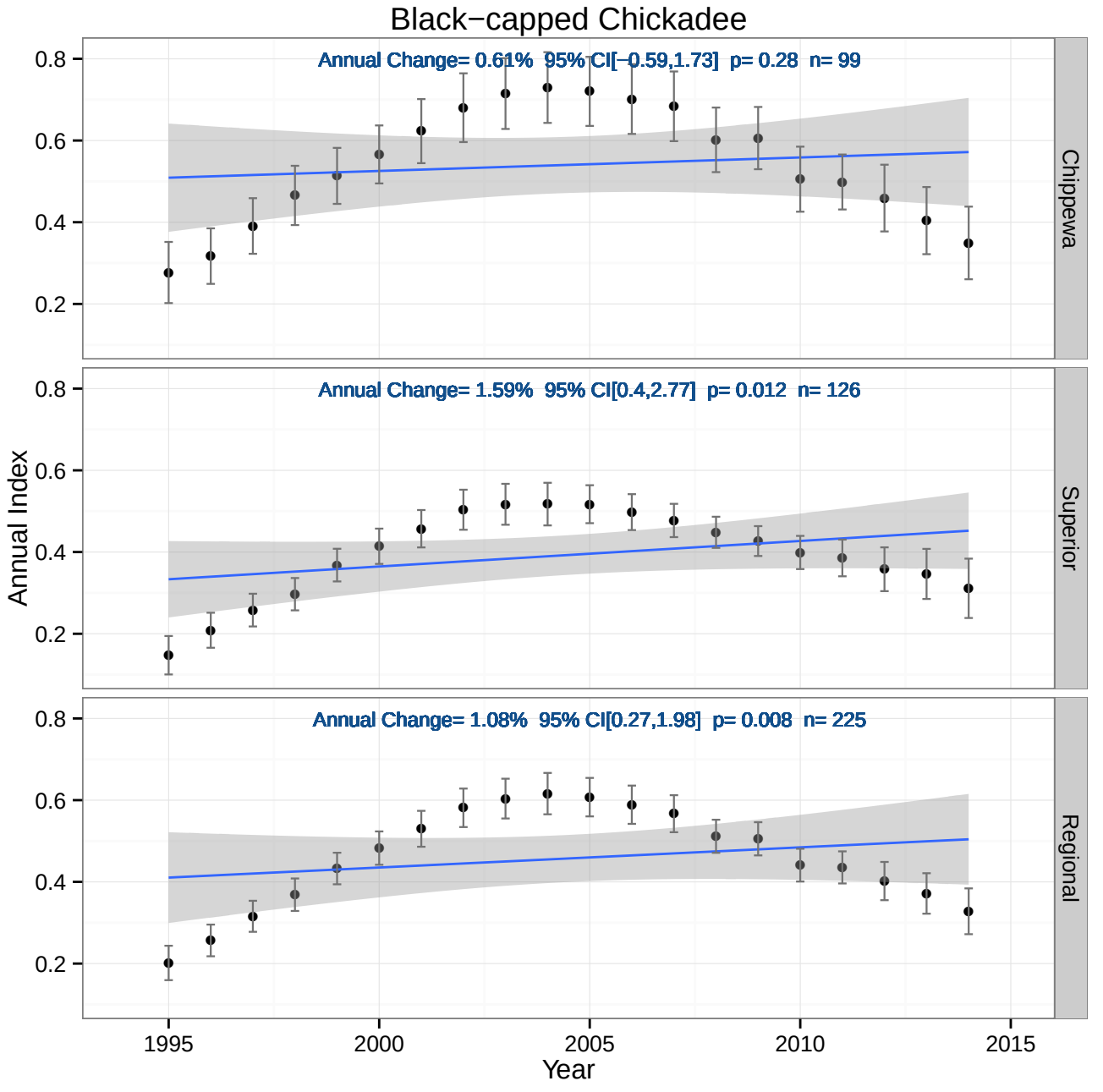

American Goldfinch
Annual Change= 5.33% 95% CI[2.24,7.96] p= 0.004 n= 21
Annual Change= 5.45% 95% CI[−1.72,11.97] p= 0.132 n= 9
Annual Change= 5.29% 95% CI[2.19,8.09] p= 0 n= 30
Chippewa
Superior
Regional
Annual Index
Year
1.00
0.75
0.50
0.25
0.00
1995
2000
2005
2010
2015

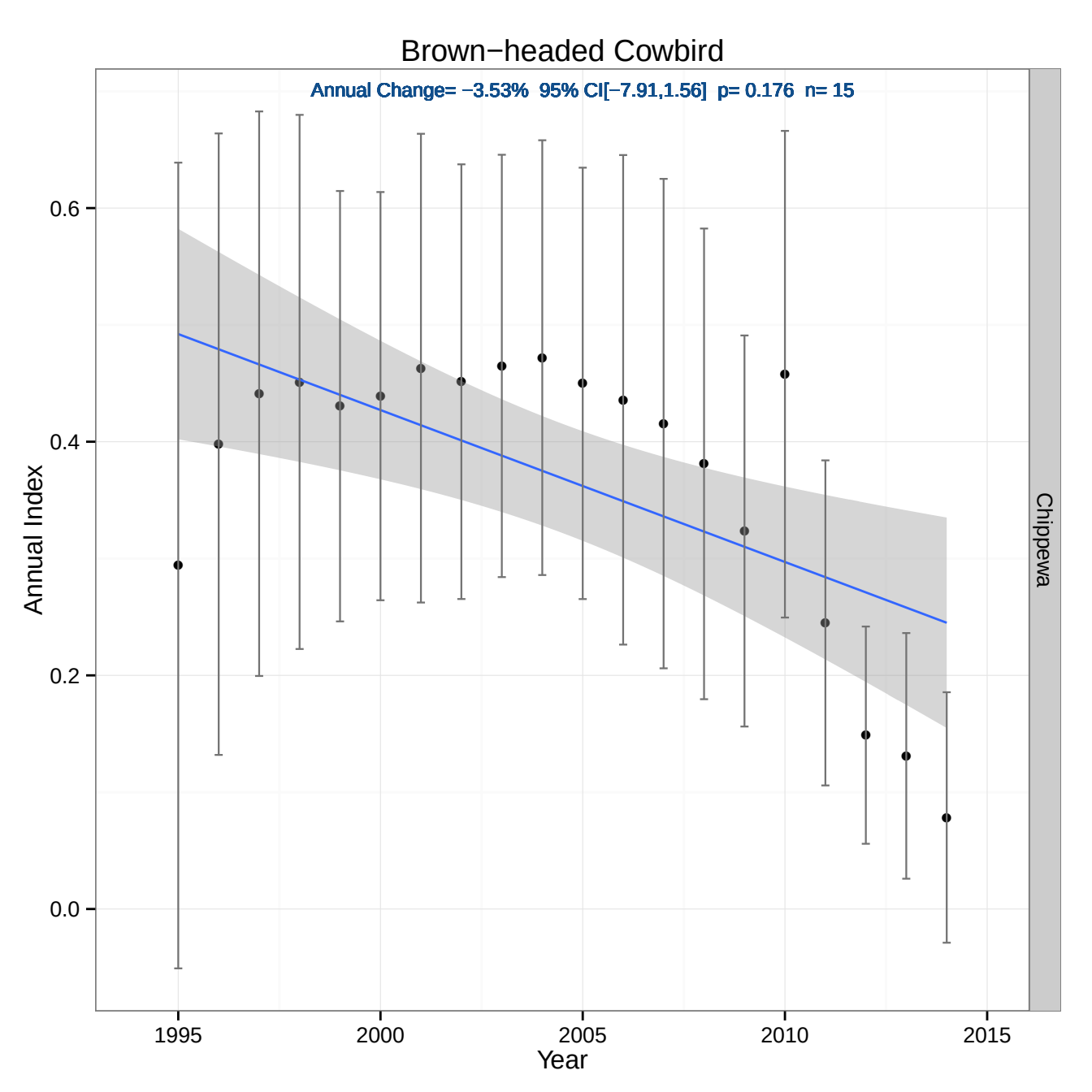

American Redstart
Annual Change= 0.93% 95% CI[−0.69,2.3] p= 0.232 n= 64
Chippewa
Annual Change= 0.42% 95% CI[−1.19,2.07] p= 0.596 n= 80
Superior
Annual Change= 0.74% 95% CI[−0.55,1.78] p= 0.232 n= 144
Regional
Annual Index
Year
1995
2000
2005
2010
2015
1
2

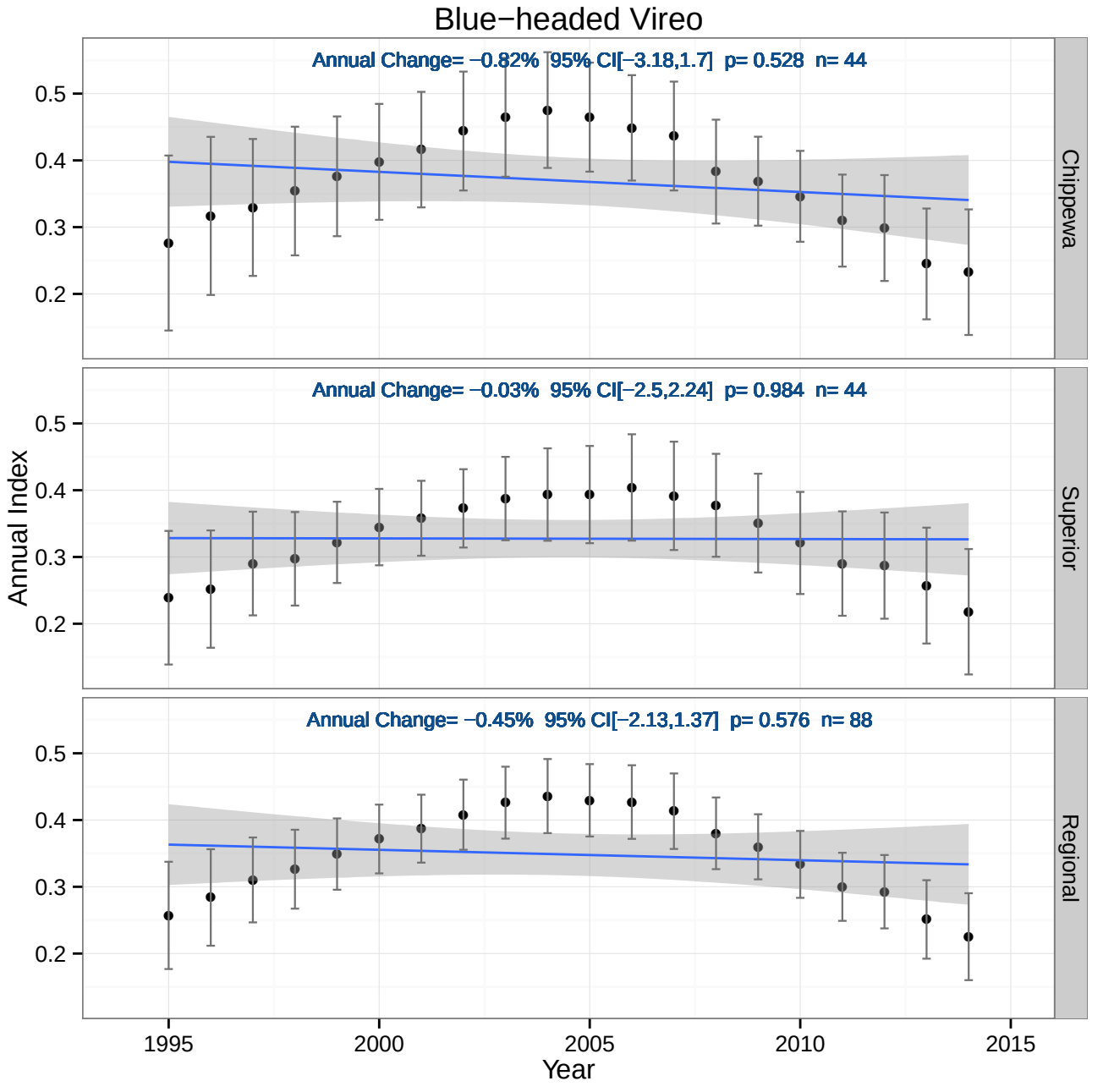

American Robin
Annual Change= −0.7% 95% CI[−1.72,0.66] p= 0.284 n= 101
Annual Change= 2.32% 95% CI[1.39,3.29] p= 0 n= 145
Annual Change= 1.21% 95% CI[0.45,1.99] p= 0 n= 246
Chippewa
Superior
Regional
Annual Index
Year
1.2
1.0
0.8
0.6
1995
2000
2005
2010
2015

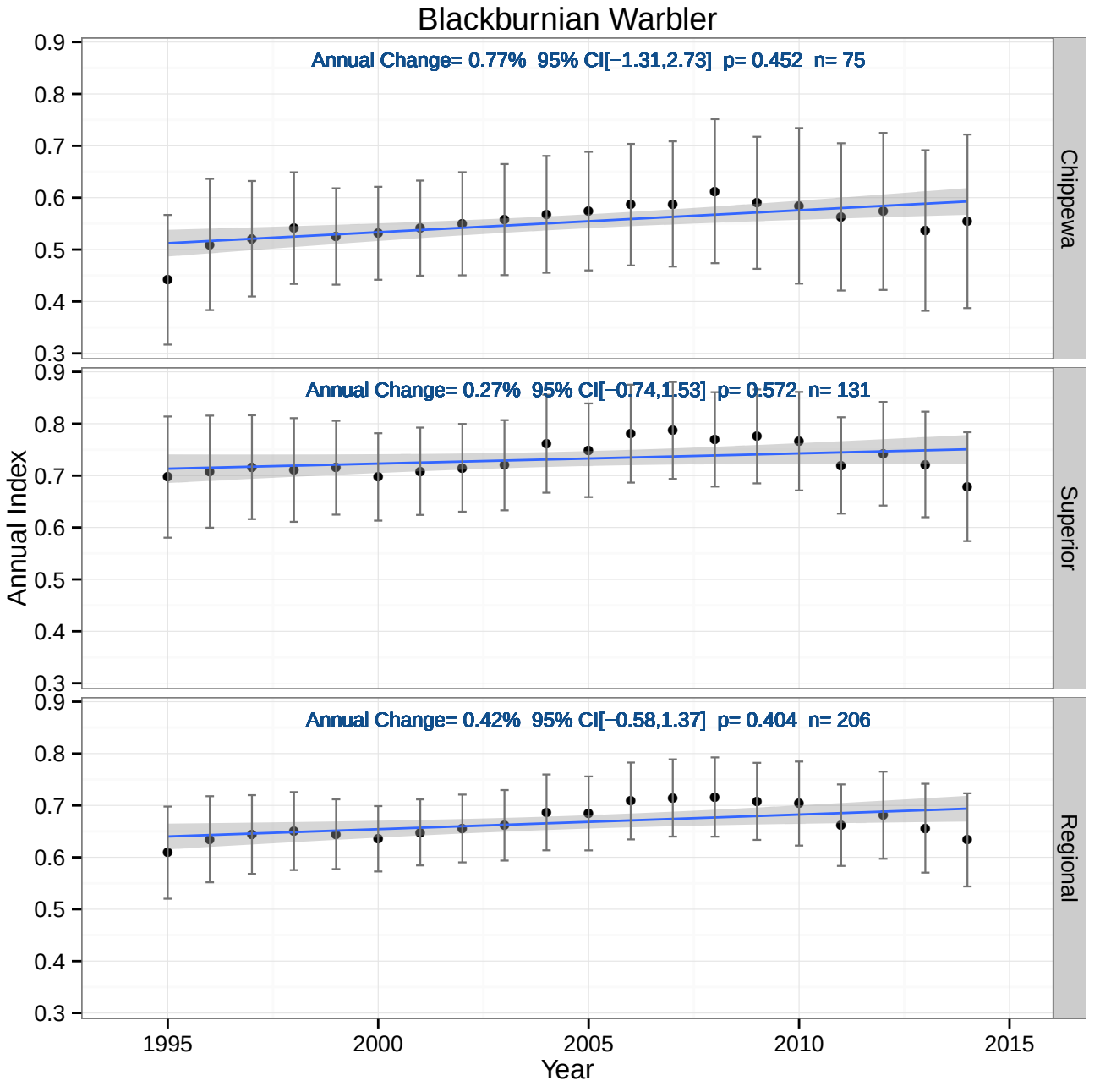

Black−and−white Warbler
Annual Change= 4.52% 95% CI[3.24,5.93] p= 0 n= 100
Annual Change= 2.99% 95% CI[2.16,3.86] p= 0 n= 134
Annual Change= 3.55% 95% CI[2.86,4.28] p= 0 n= 234
Chippewa
Superior
Regional
Annual Index
0.4
0.6
0.8
1995
2000
2005
2010
2015
Year

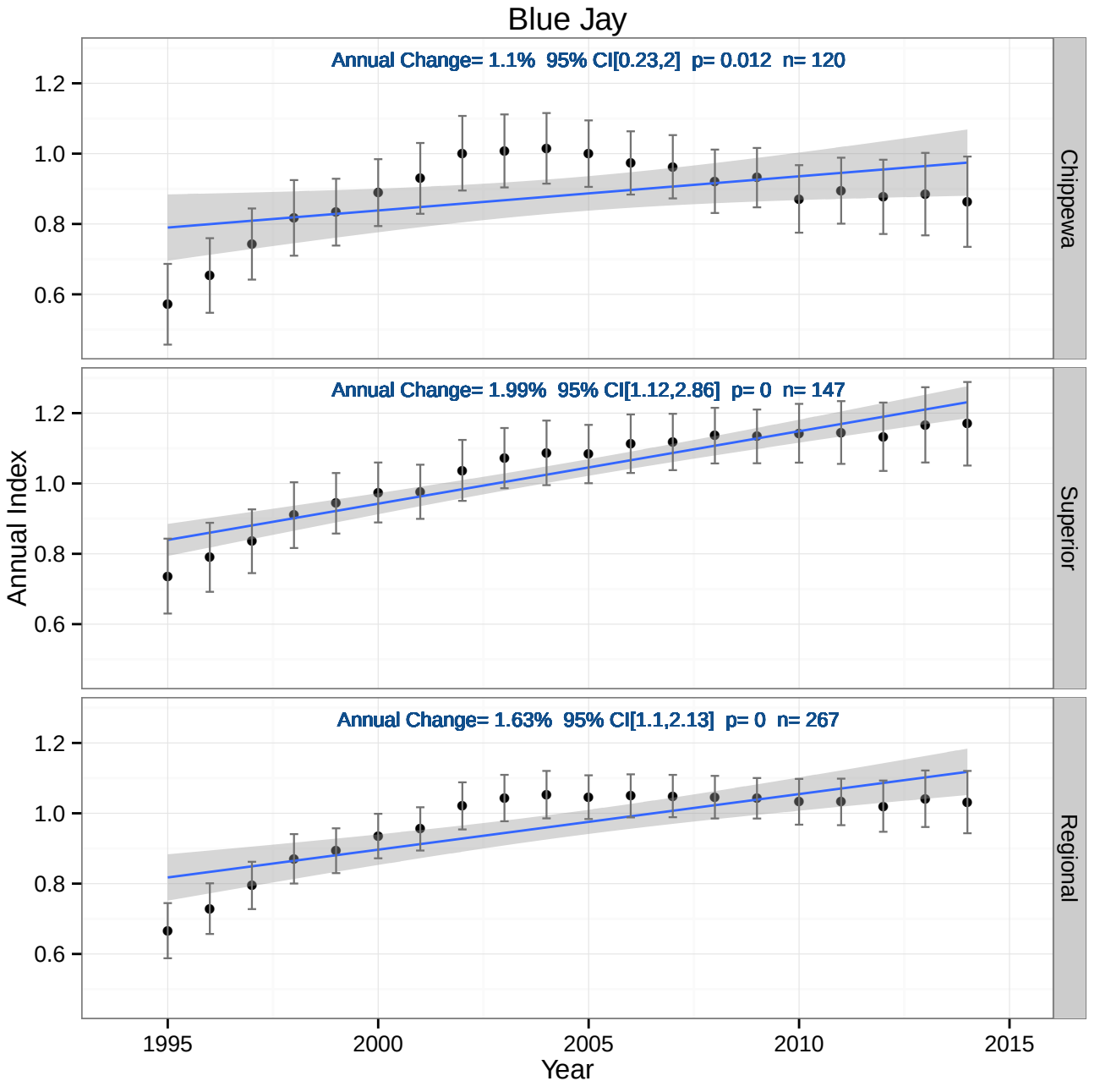

Black−billed Cuckoo
Annual Change= −0.2% 95% CI[−6.47,4.55] p= 0.852 n= 5
Annual Index
1.0
0.5
0.0
−0.5
1995
2000
2005
2010
2015
Year
Superior

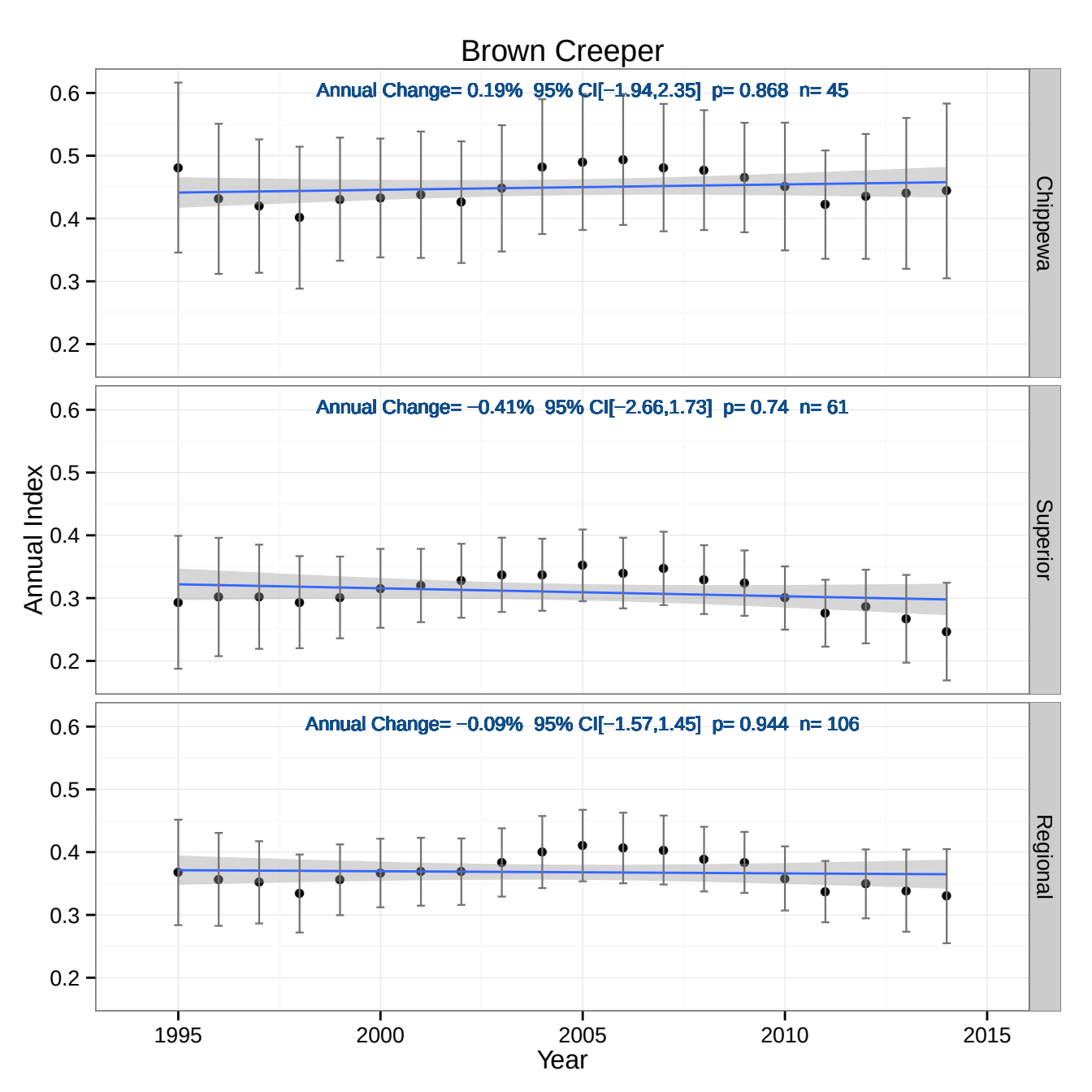

Black−capped Chickadee
Annual Change= 0.61% 95% CI[−0.59,1.73] p= 0.28 n= 99
Annual Change= 1.59% 95% CI[0.4,2.77] p= 0.012 n= 126
Annual Change= 1.08% 95% CI[0.27,1.98] p= 0.008 n= 225
Chippewa
Superior
Regional
Annual Index
Year
0.2
0.4
0.6
0.8
1995
2000
2005
2010
2015

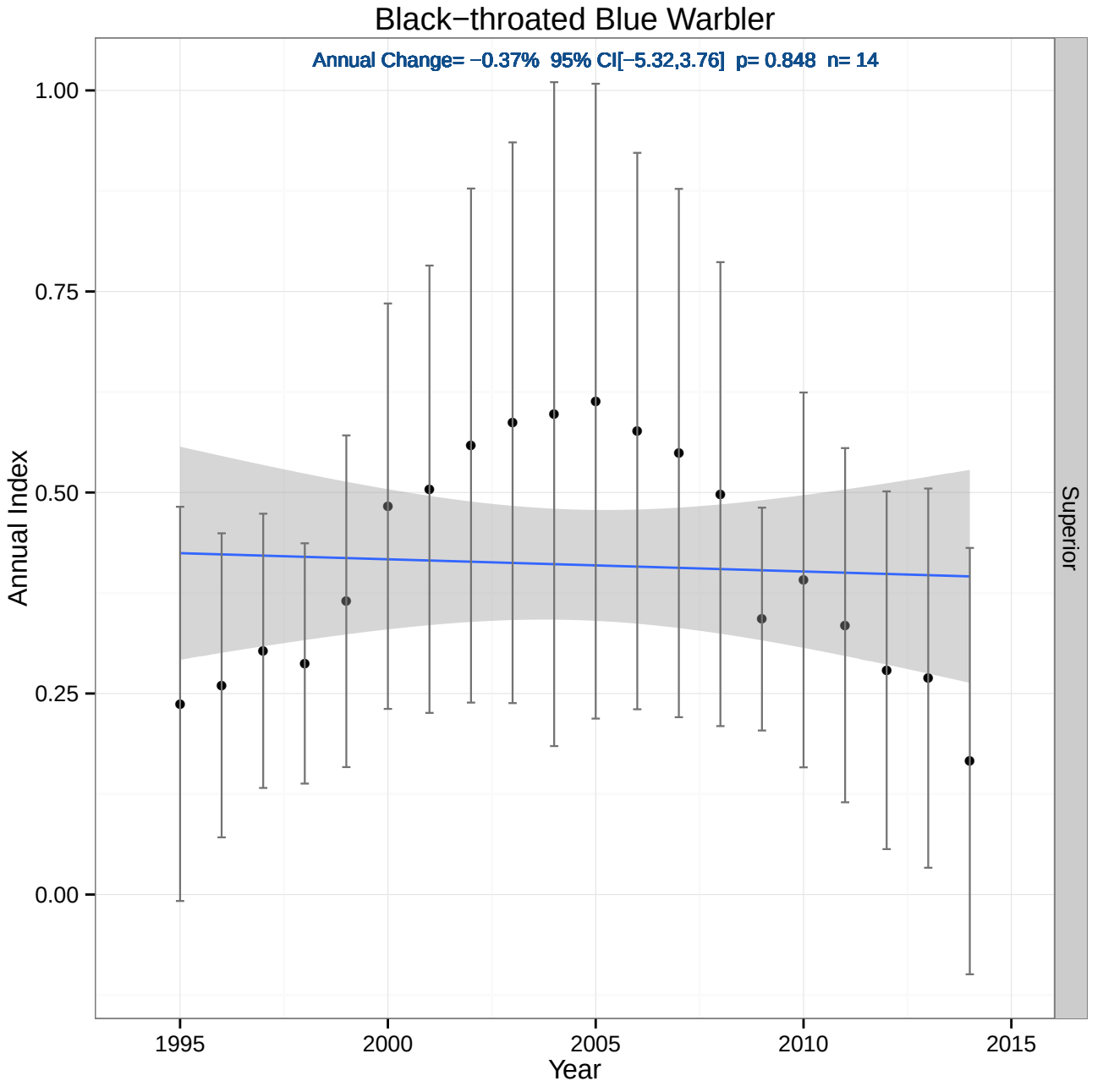

Brown−headed Cowbird
Annual Change= −3.53% 95% CI[−7.91,1.56] p= 0.176 n= 15
Annual Index
0.0
0.2
0.4
0.6
1995
2000
2005
2010
2015
Year
Chippewa

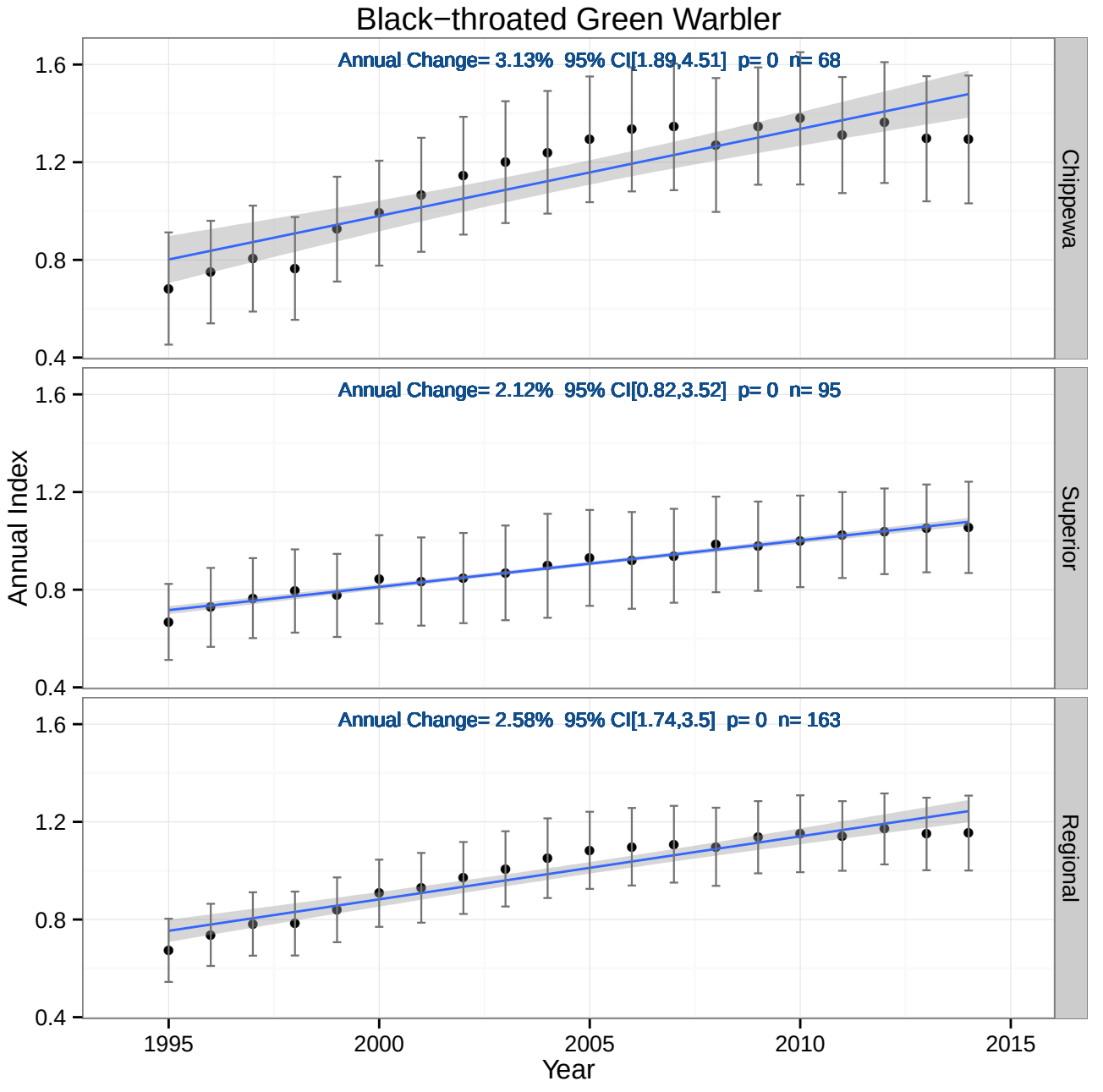

Blue−headed Vireo
Annual Change= −0.82% 95% CI[−3.18,1.7] p= 0.528 n= 44
Chippewa
Annual Change= −0.03% 95% CI[−2.5,2.24] p= 0.984 n= 44
Superior
Annual Change= −0.45% 95% CI[−2.13,1.37] p= 0.576 n= 88
Regional
Annual Index
0.5
0.4
0.3
0.2
1995
2000
2005
2010
2015
Year

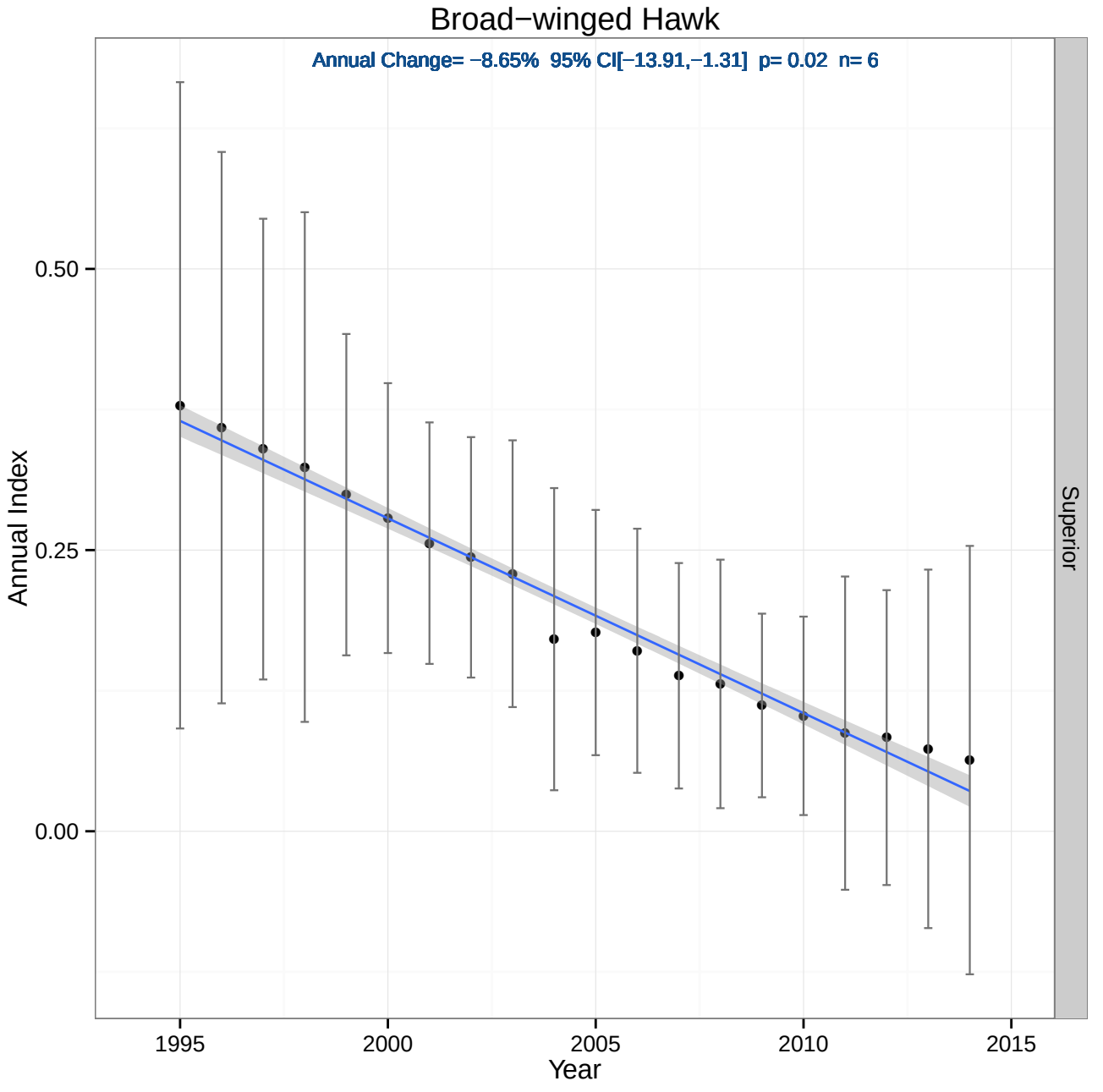

Blackburnian Warbler
Annual Change= 0.77% 95% CI[−1.31,2.73] p= 0.452 n= 75
Annual Change= 0.27% 95% CI[−0.74,1.53] p= 0.572 n= 131
Annual Change= 0.42% 95% CI[−0.58,1.37] p= 0.404 n= 206
Chippewa
Superior
Regional
Annual Index
Year
0.9
0.8
0.7
0.6
0.5
0.4
0.3
1995
2000
2005
2010
2015

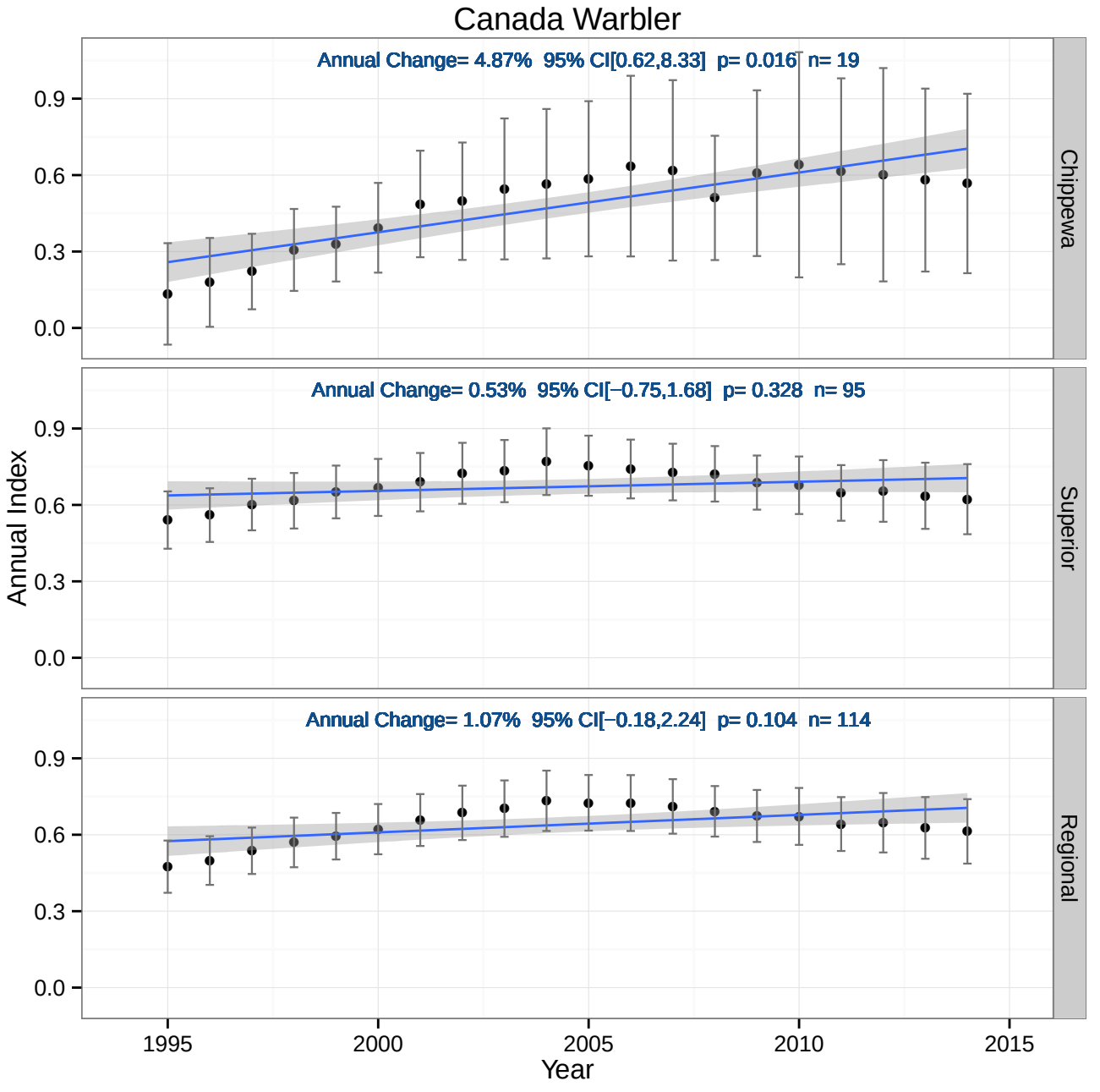

Blue Jay
Annual Change= 1.1% 95% CI[0.23,2] p= 0.012 n= 120
Annual Change= 1.99% 95% CI[1.12,2.86] p= 0 n= 147
Annual Change= 1.63% 95% CI[1.1,2.13] p= 0 n= 267
Chippewa
Superior
Regional
Annual Index
Year
1.2
1.0
0.8
0.6
1995
2000
2005
2010
2015

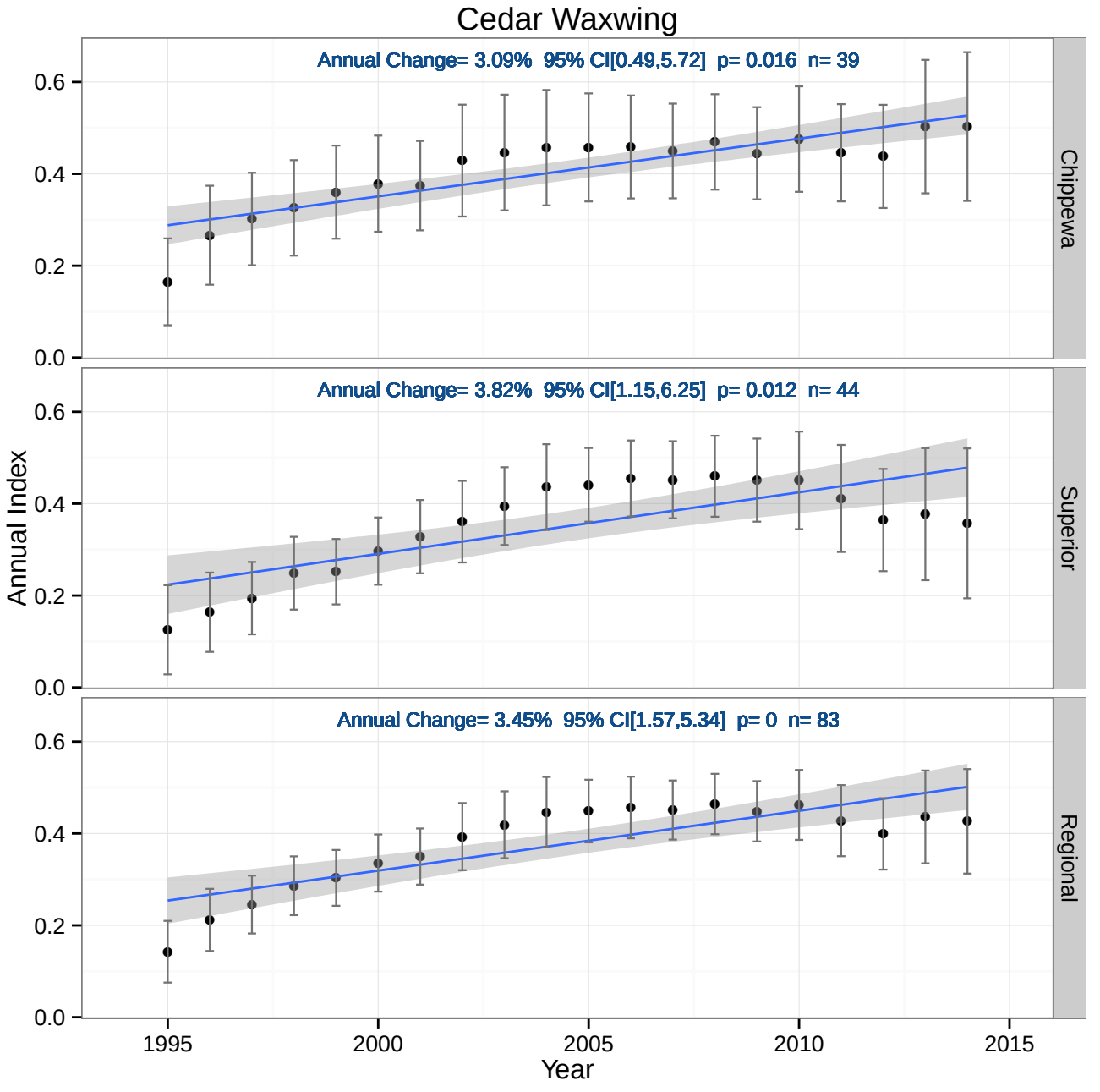

Brown Creeper
Annual Change= 0.19% 95% CI[−1.94,2.35] p= 0.868 n= 45
Annual Change= −0.41% 95% CI[−2.66,1.73] p= 0.74 n= 61
Annual Change= −0.09% 95% CI[−1.57,1.45] p= 0.944 n= 106
Chippewa
Superior
Regional
Annual Index
Year
0.2
0.3
0.4
0.5
0.6
1995
2000
2005
2010
2015

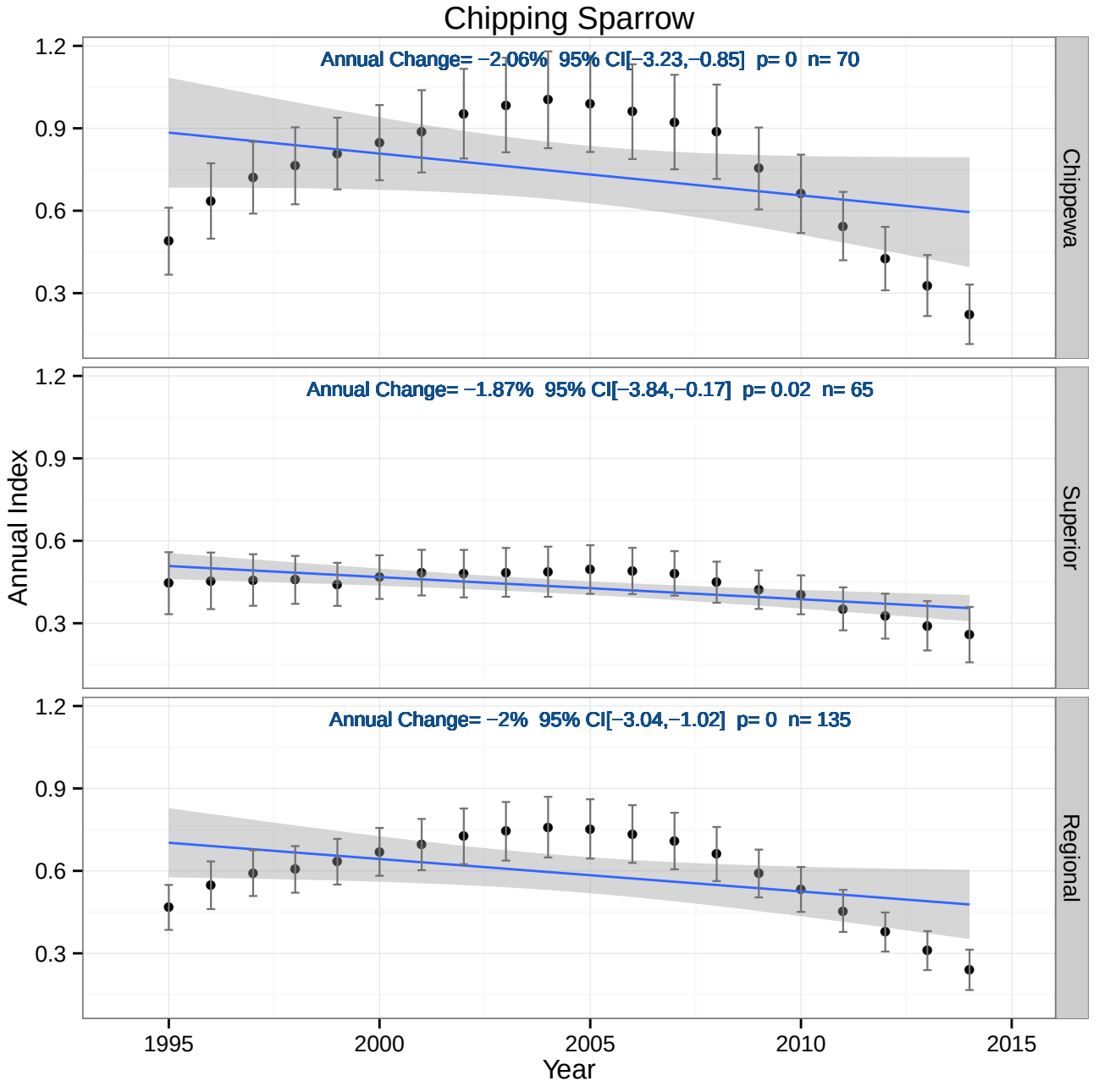

Black−throated Blue Warbler
Annual Change= −0.37% 95% CI[−5.32,3.76] p= 0.848 n= 14
Annual Index
1.00
0.75
0.50
0.25
0.00
1995
2000
2005
2010
2015
Year
Superior

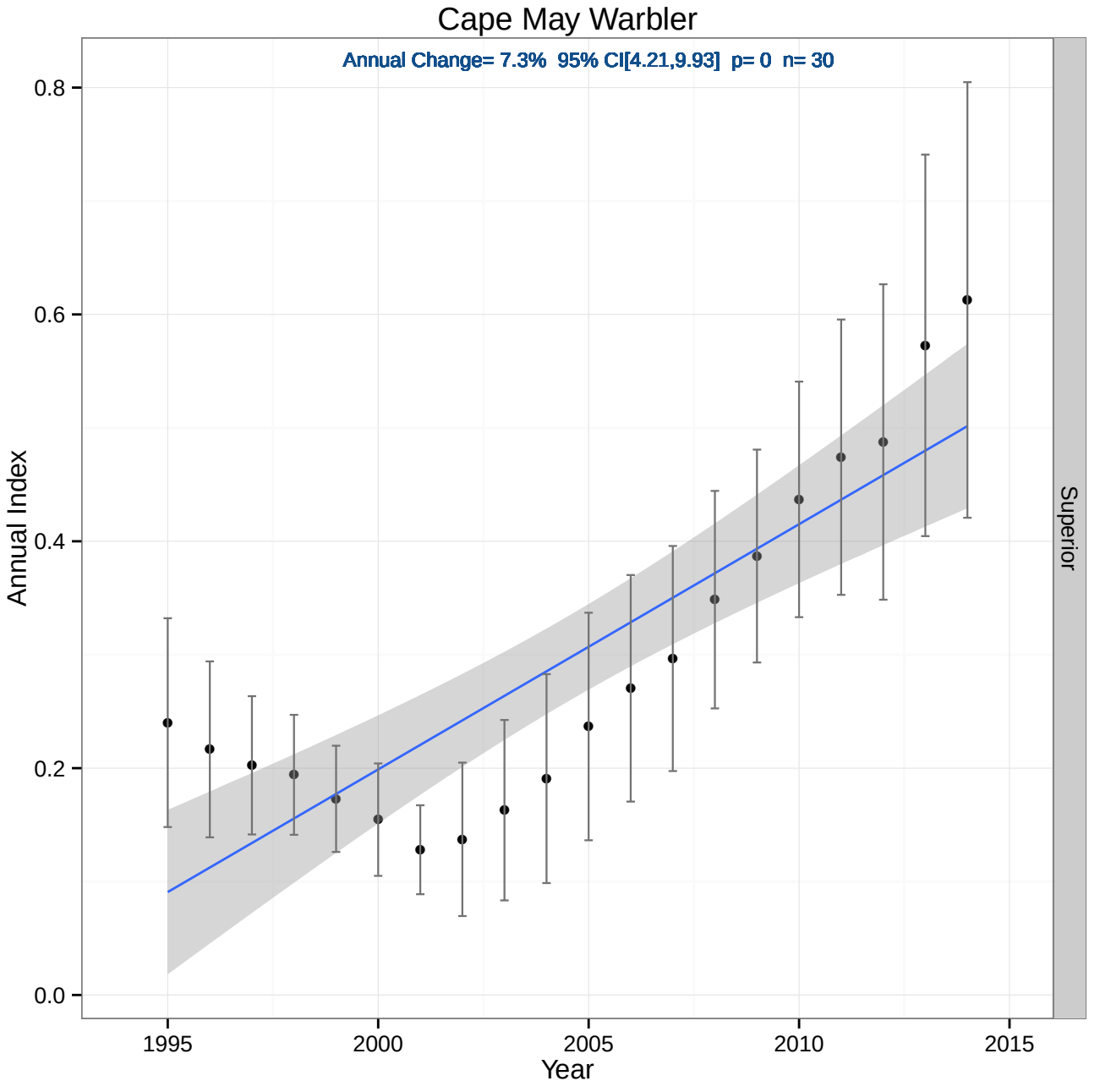

Black−throated Green Warbler
Annual Change= 3.13% 95% CI[1.89,4.51] p= 0 n= 68
Annual Change= 2.12% 95% CI[0.82,3.52] p= 0 n= 95
Annual Change= 2.58% 95% CI[1.74,3.5] p= 0 n= 163
Chippewa
Superior
Regional
Annual Index
Year
0.4
0.8
1.2
1.6
1995
2000
2005
2010
2015

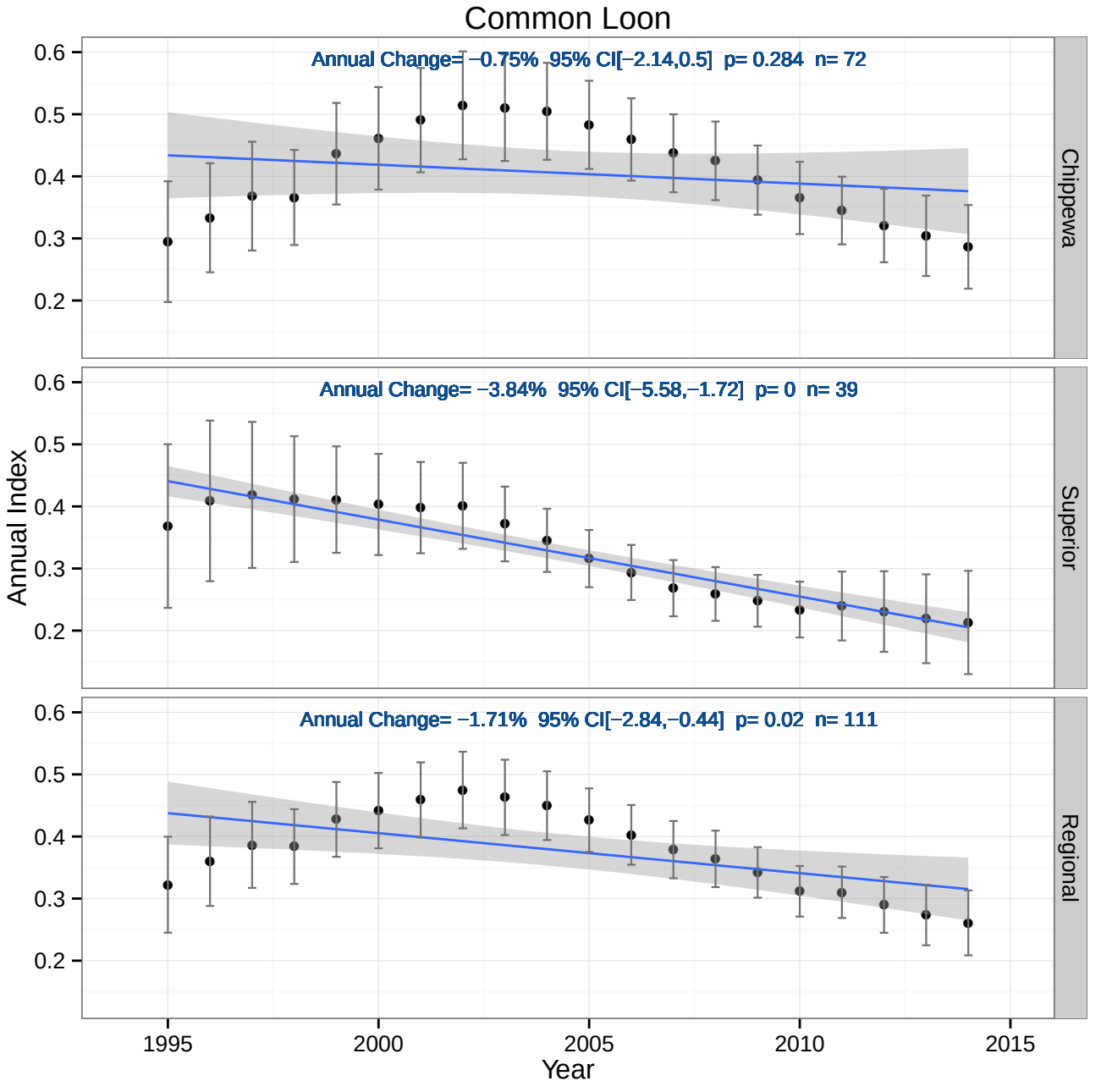

Broad−winged Hawk
Annual Change= −8.65% 95% CI[−13.91,−1.31] p= 0.02 n= 6
0.50
0.25
0.00
Annual Index
1995
2000
2005
2010
2015
Year
Superior

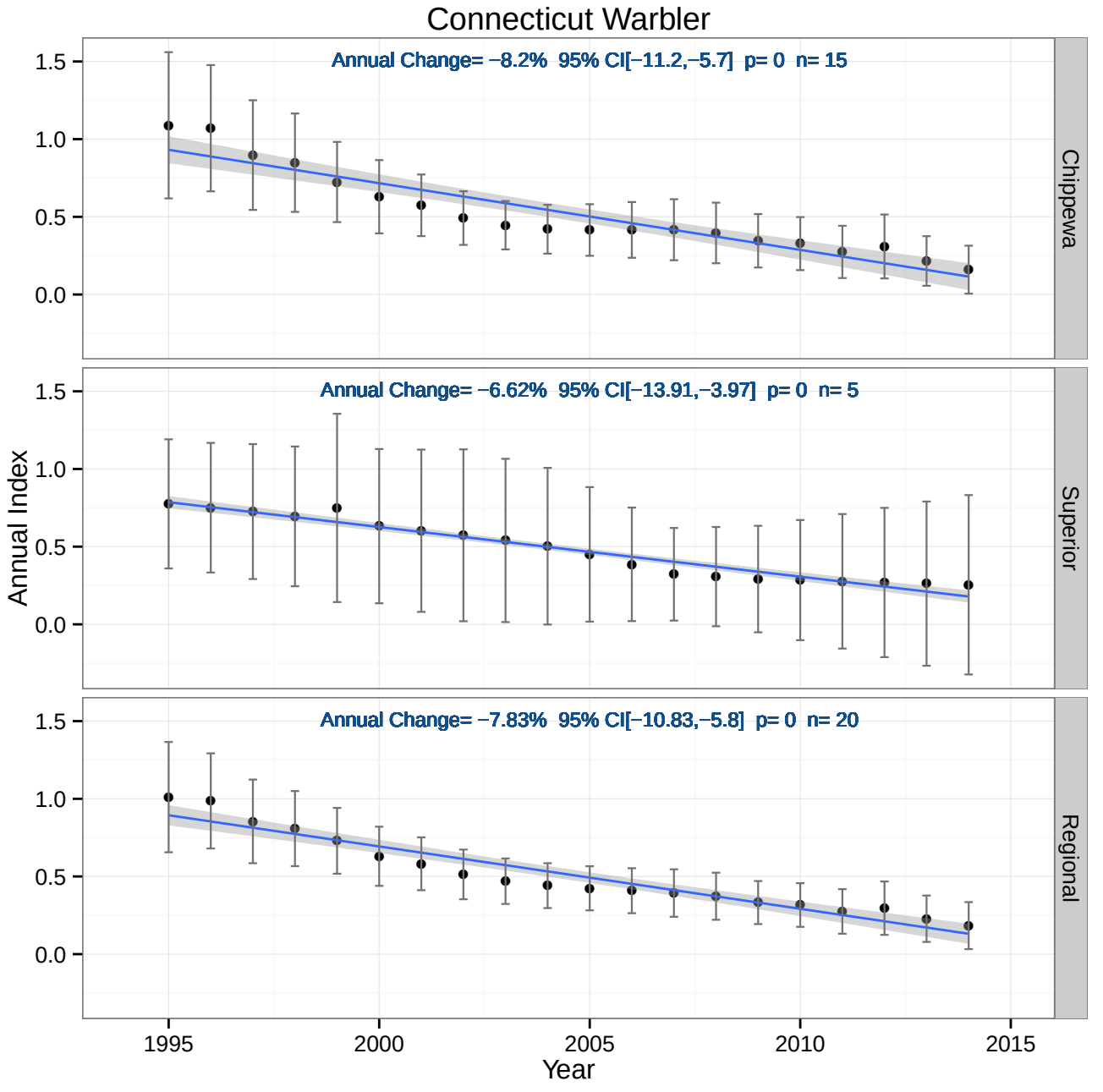

Canada Warbler
Annual Change= 4.87% 95% CI[0.62,8.33] p= 0.016 n= 19
Annual Change= 0.53% 95% CI[−0.75,1.68] p= 0.328 n= 95
Annual Change= 1.07% 95% CI[−0.18,2.24] p= 0.104 n= 114
Chippewa
Superior
Regional
Annual Index
0.0
0.3
0.6
0.9
1995
2000
2005
2010
2015
Year

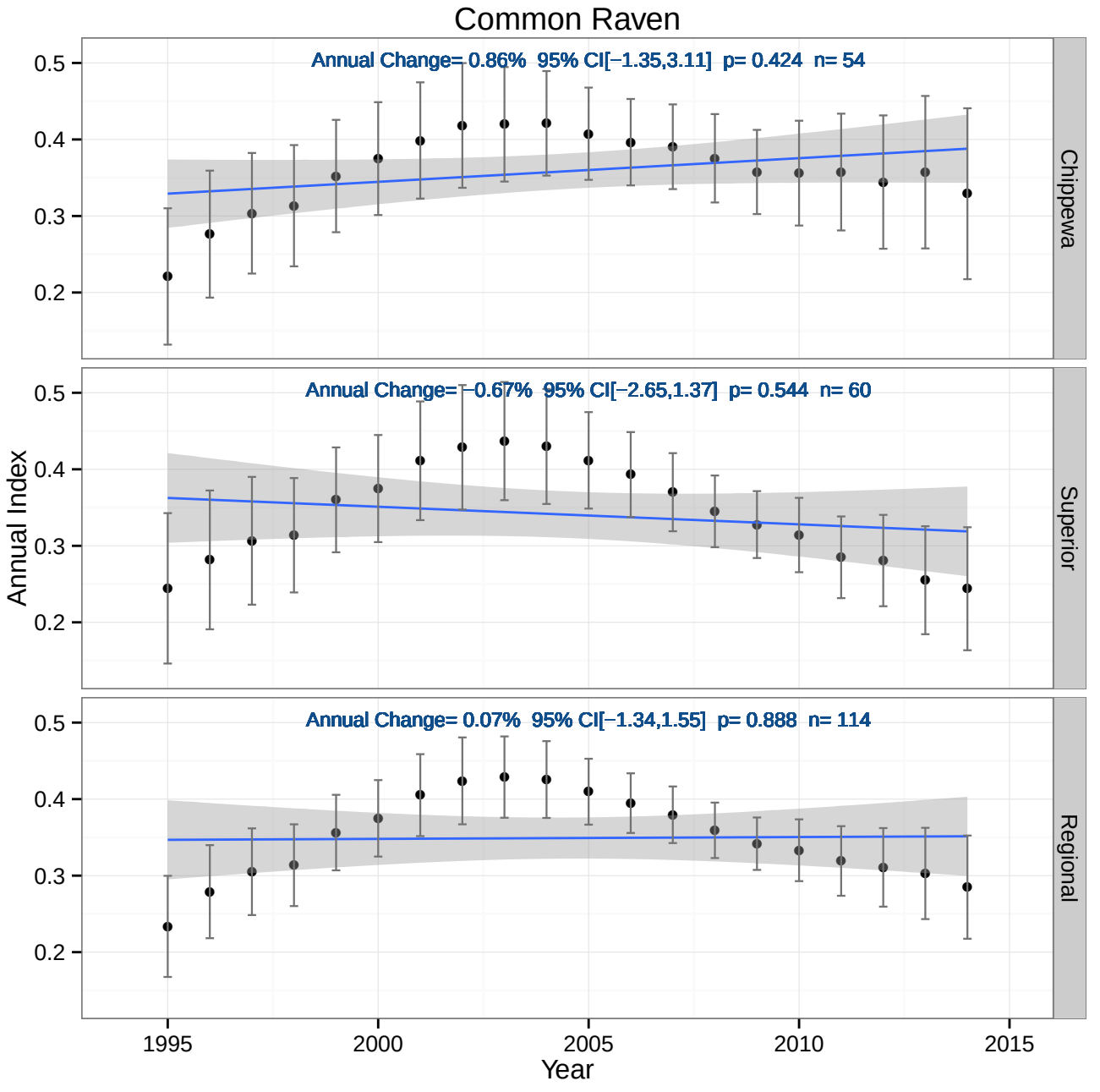

Cedar Waxwing
Annual Change= 3.09% 95% CI[0.49,5.72] p= 0.016 n= 39
Annual Change= 3.82% 95% CI[1.15,6.25] p= 0.012 n= 44
Annual Change= 3.45% 95% CI[1.57,5.34] p= 0 n= 83
Chippewa
Superior
Regional
Annual Index
Year
0.0
0.2
0.4
0.6
1995
2000
2005
2010
2015

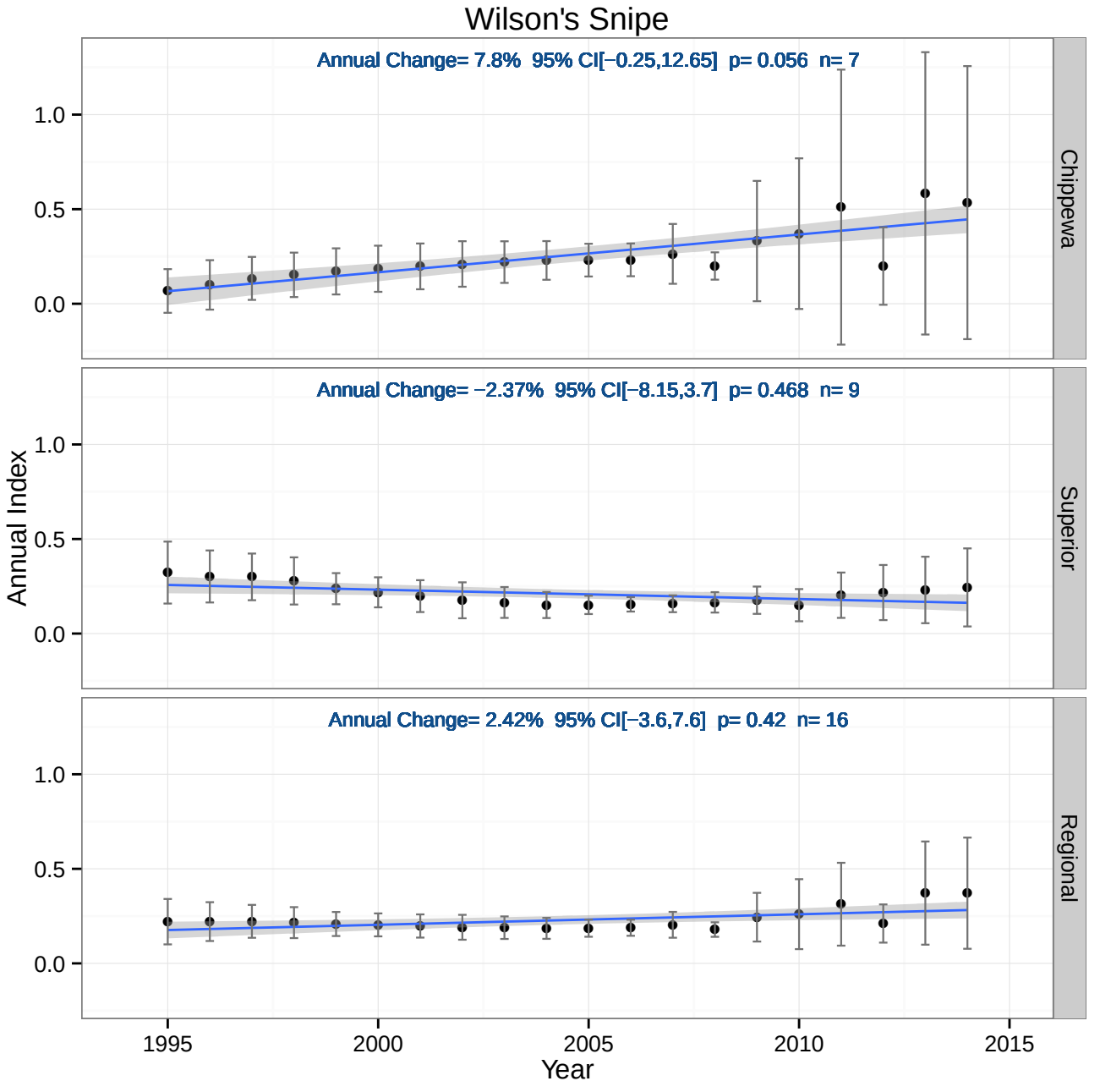

Chipping Sparrow
Annual Change= −2.06% 95% CI[−3.23,−0.85] p= 0 n= 70
Annual Change= −1.87% 95% CI[−3.84,−0.17] p= 0.02 n= 65
Annual Change= −2% 95% CI[−3.04,−1.02] p= 0 n= 135
Chippewa
Superior
Regional
Annual Index
1.2
0.9
0.6
0.3
1995
2000
2005
2010
2015
Year

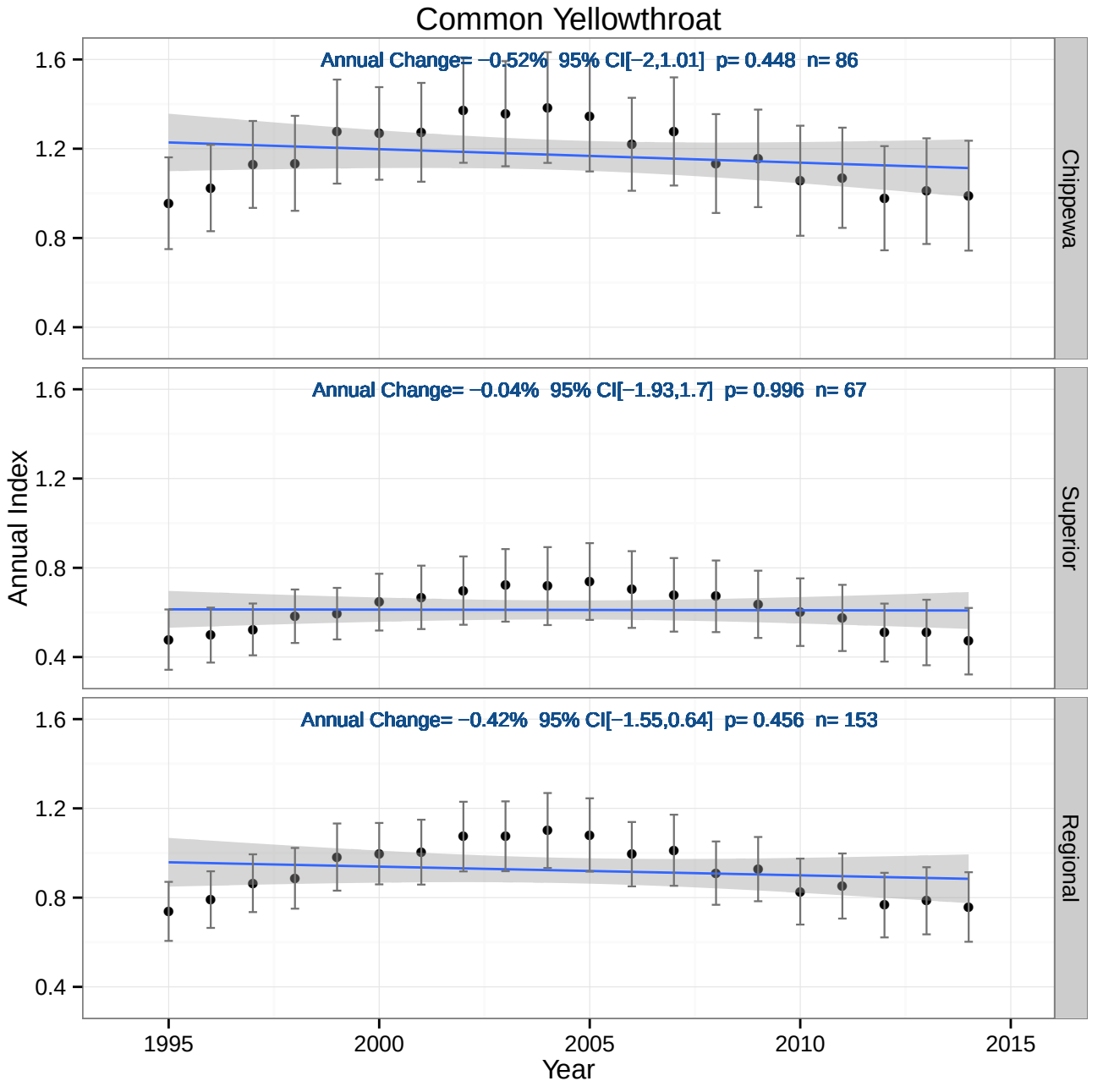

Cape May Warbler
Annual Change= 7.3% 95% CI[4.21,9.93] p= 0 n= 30
Annual Index
0.0
0.2
0.4
0.6
0.8
1995
2000
2005
2010
2015
Year
Superior

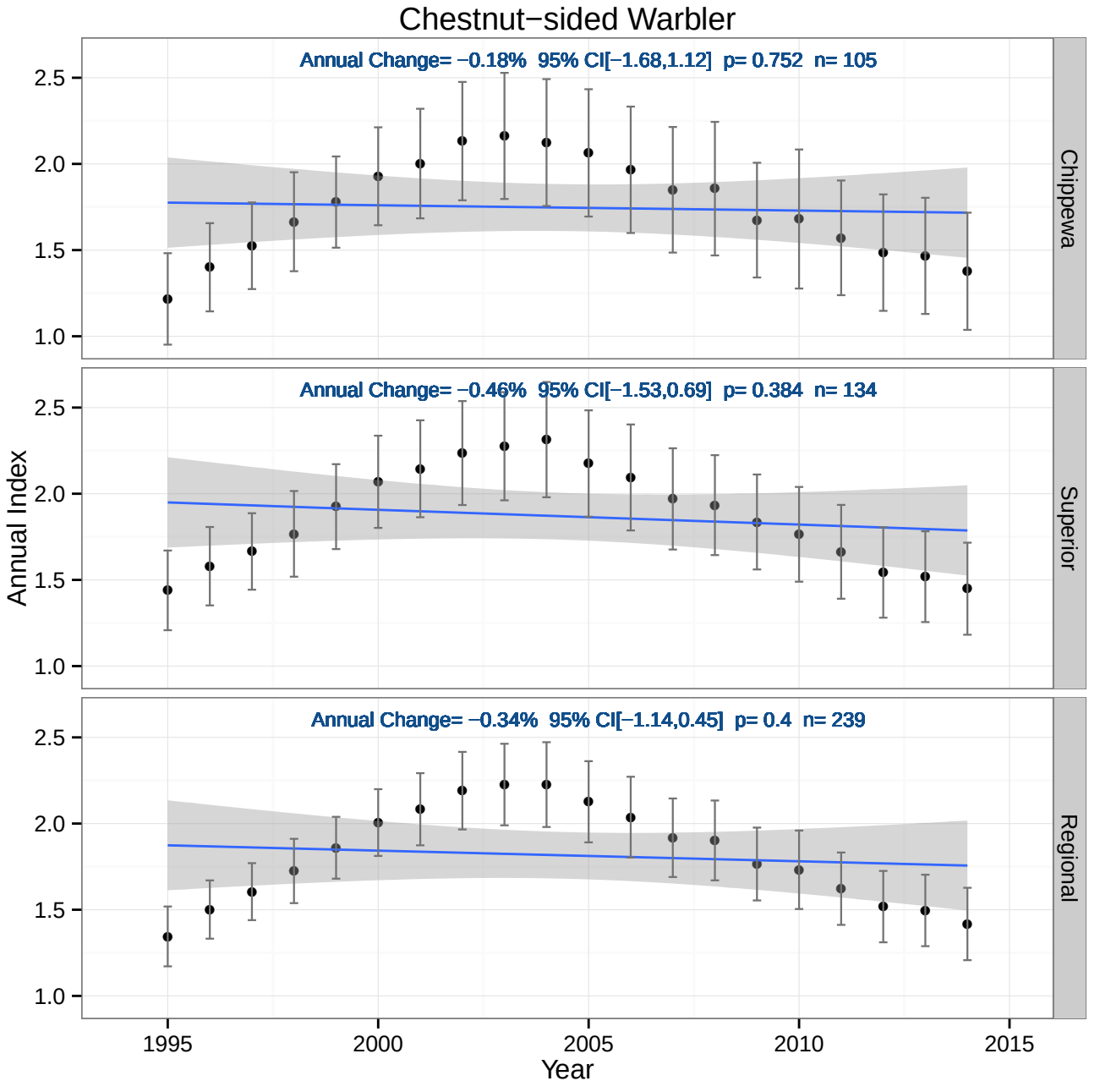

Common Loon
Annual Change= −0.75% 95% CI[−2.14,0.5] p= 0.284 n= 72
Annual Change= −3.84% 95% CI[−5.58,−1.72] p= 0 n= 39
Annual Change= −1.71% 95% CI[−2.84,−0.44] p= 0.02 n= 111
Chippewa
Superior
Regional
Annual Index
Year
0.6
0.5
0.4
0.3
0.2
1995
2000
2005
2010
2015

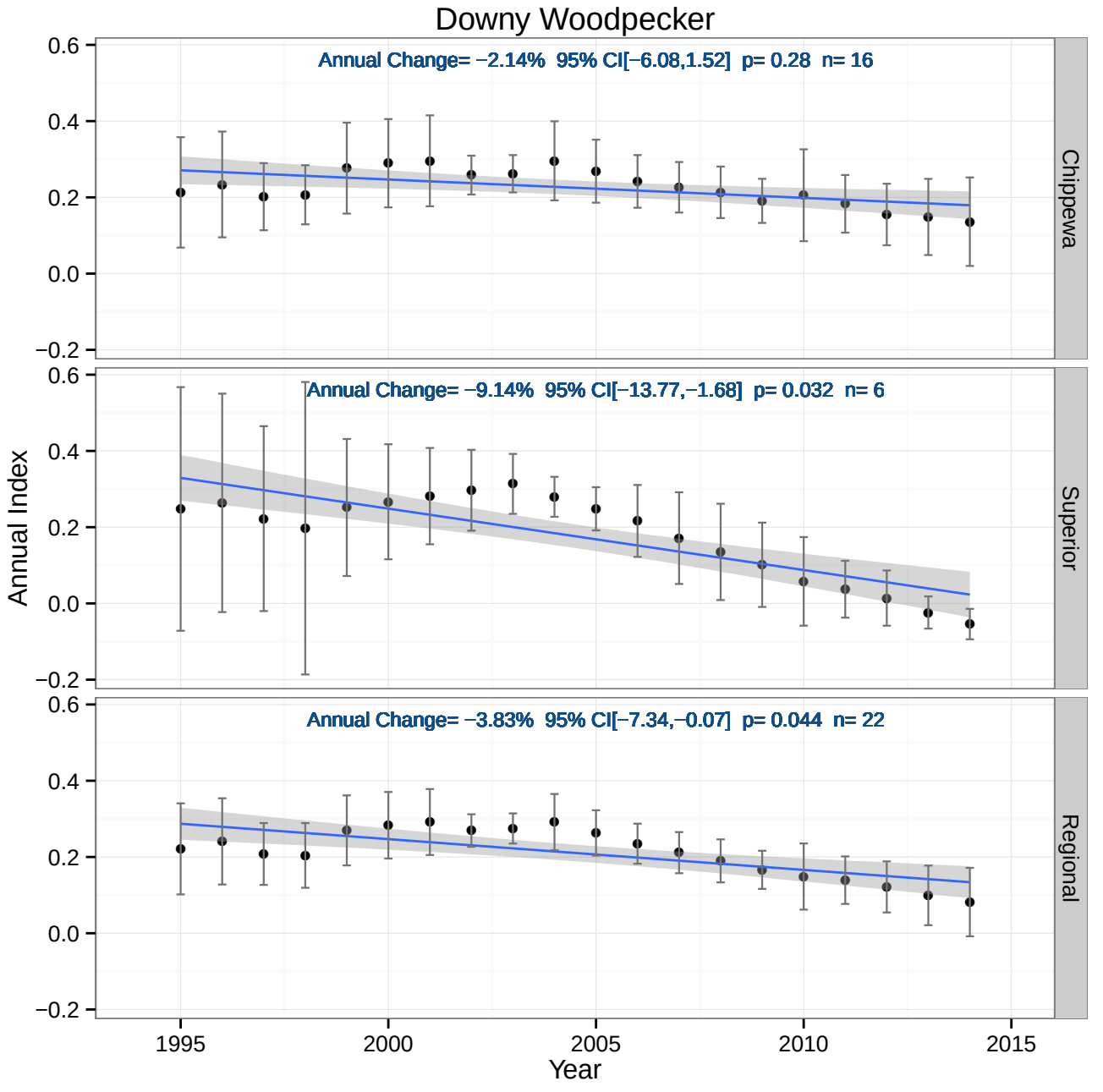

Connecticut Warbler
Annual Change= −8.2% 95% CI[−11.2,−5.7] p= 0 n= 15
Annual Change= −6.62% 95% CI[−13.91,−3.97] p= 0 n= 5
Annual Change= −7.83% 95% CI[−10.83,−5.8] p= 0 n= 20
Chippewa
Superior
Regional
Annual Index
Year
1.5
1.0
0.5
0.0
1995
2000
2005
2010
2015

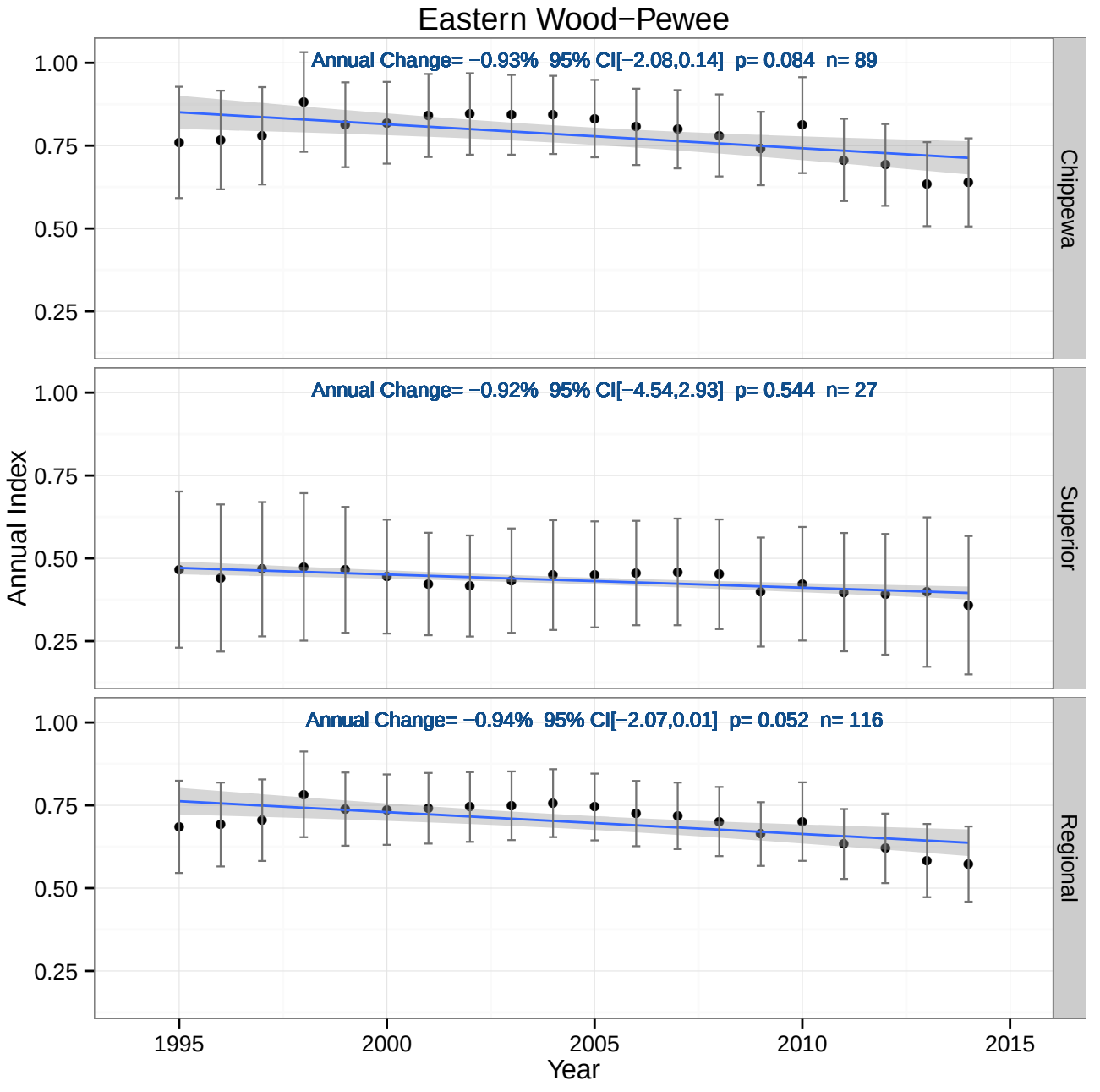

Common Raven
Annual Change= 0.86% 95% CI[−1.35,3.11] p= 0.424 n= 54
Annual Change= −0.67% 95% CI[−2.65,1.37] p= 0.544 n= 60
Annual Change= 0.07% 95% CI[−1.34,1.55] p= 0.888 n= 114
Chippewa
Superior
Regional
Annual Index
0.5
0.4
0.3
0.2
1995
2000
2005
2010
2015
Year

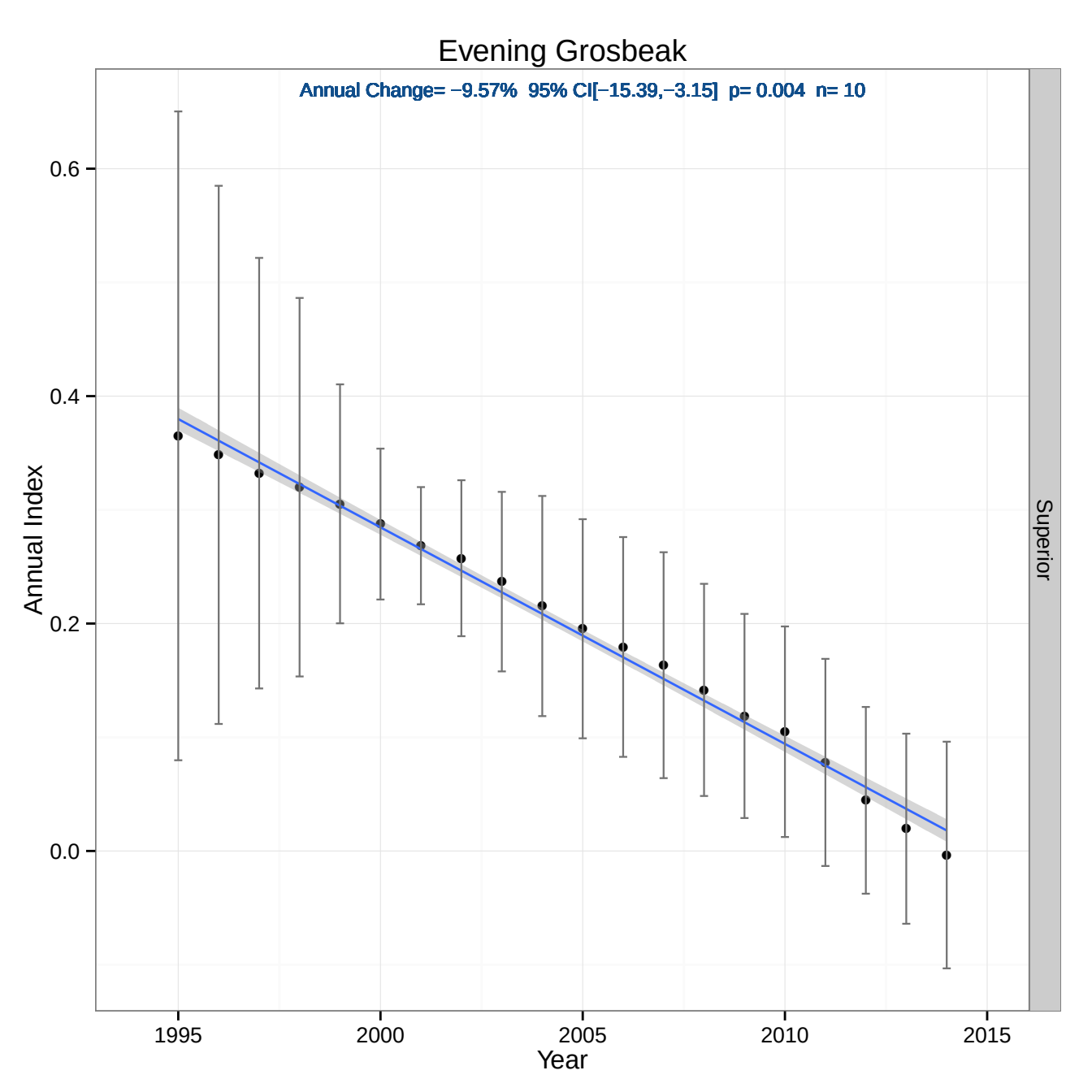

Wilson's Snipe
Annual Change= 7.8% 95% CI[−0.25,12.65] p= 0.056 n= 7
Annual Change= −2.37% 95% CI[−8.15,3.7] p= 0.468 n= 9
Annual Change= 2.42% 95% CI[−3.6,7.6] p= 0.42 n= 16
Chippewa
Superior
Regional
Annual Index
Year
1.0
0.5
0.0
1995
2000
2005
2010
2015

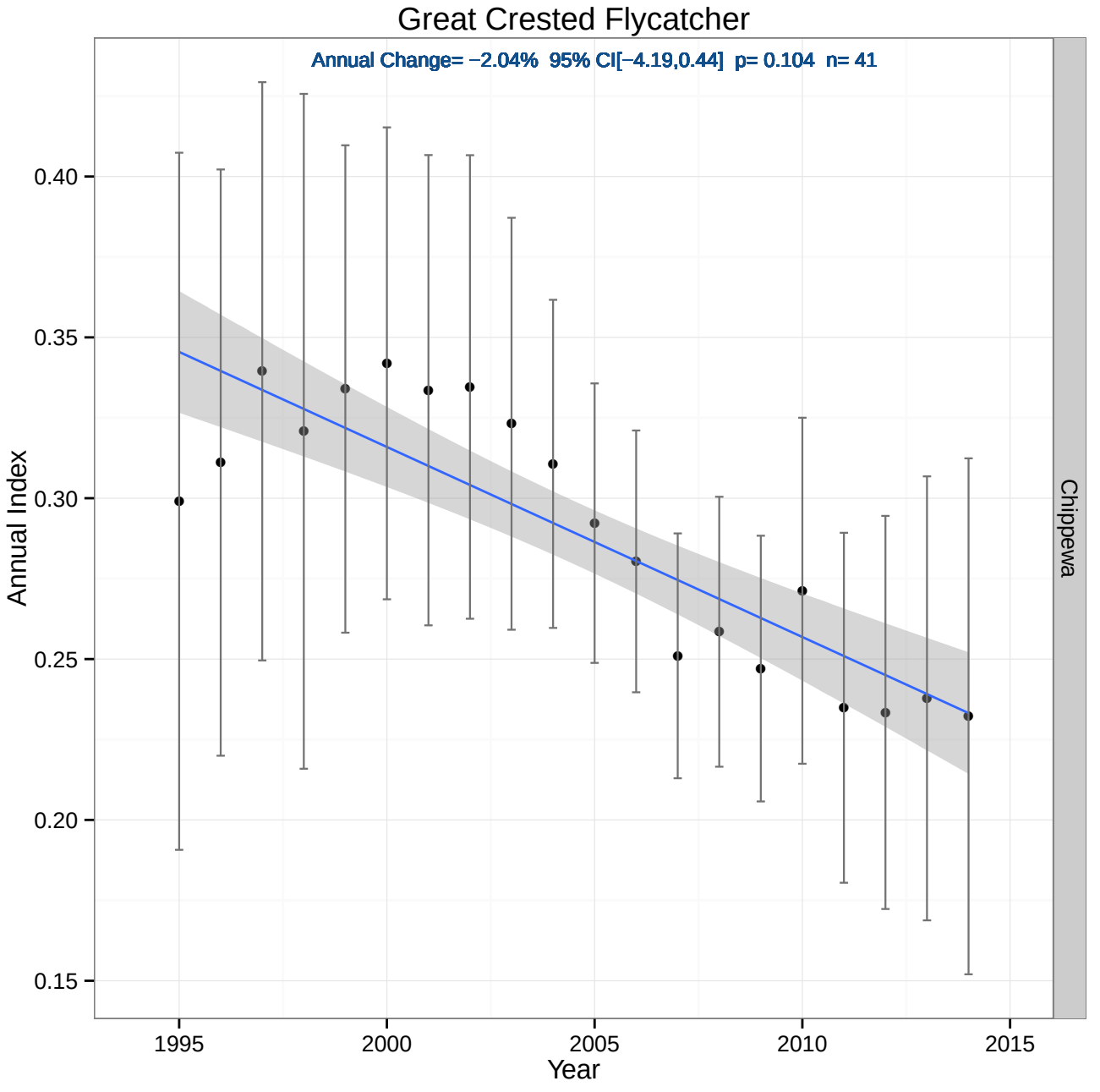

Common Yellowthroat
Annual Change= −0.52% 95% CI[−2,1.01] p= 0.448 n= 86
Annual Change= −0.04% 95% CI[−1.93,1.7] p= 0.996 n= 67
Annual Change= −0.42% 95% CI[−1.55,0.64] p= 0.456 n= 153
Chippewa
Superior
Regional
Annual Index
Year
1.6
1.2
0.8
0.4
1995
2000
2005
2010
2015

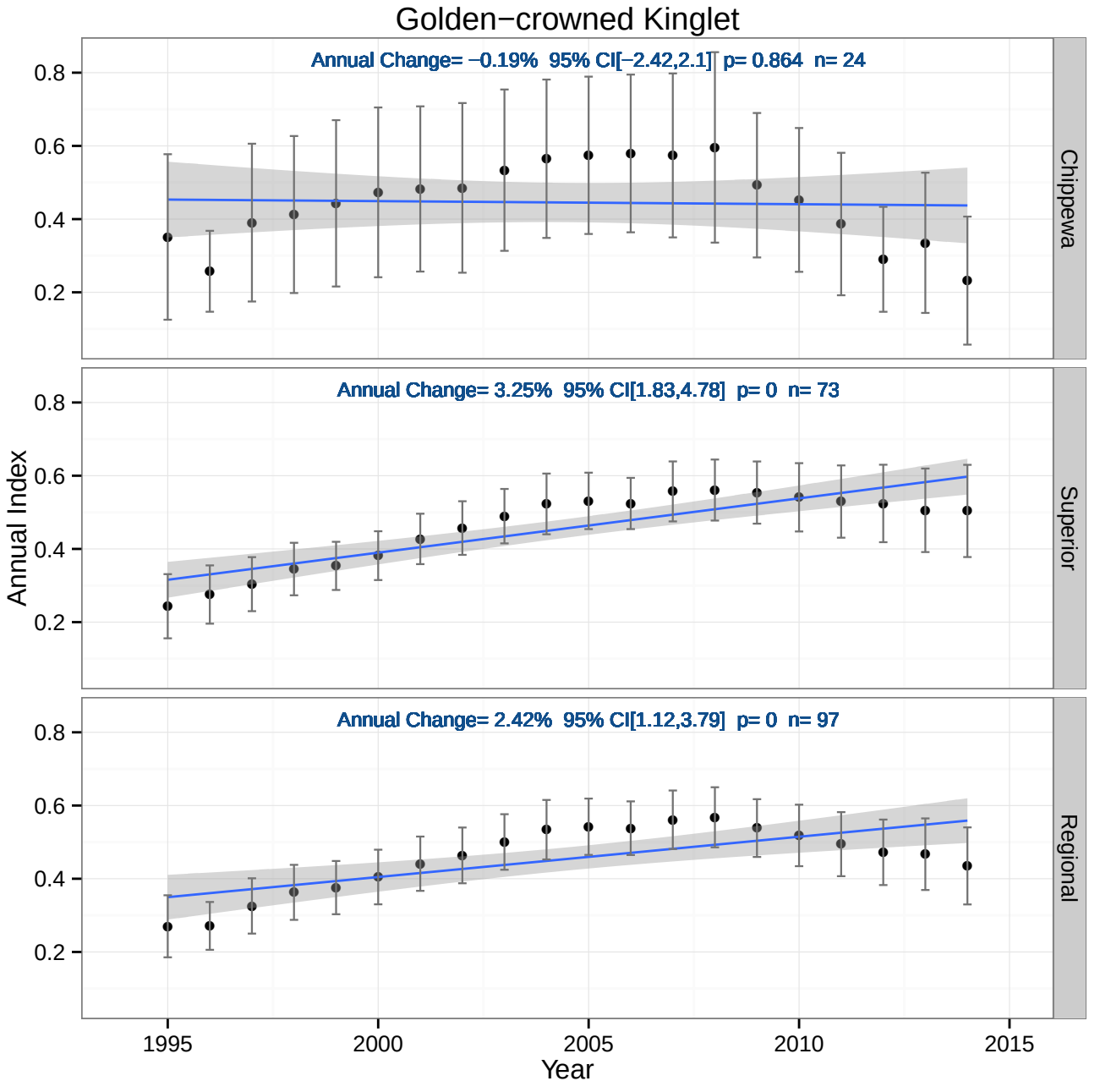

Chestnut−sided Warbler
Annual Change= −0.18% 95% CI[−1.68,1.12] p= 0.752 n= 105
Annual Change= −0.46% 95% CI[−1.53,0.69] p= 0.384 n= 134
Annual Change= −0.34% 95% CI[−1.14,0.45] p= 0.4 n= 239
Chippewa
Superior
Regional
Annual Index
Year
1.0
1.5
2.0
2.5
1995
2000
2005
2010
2015

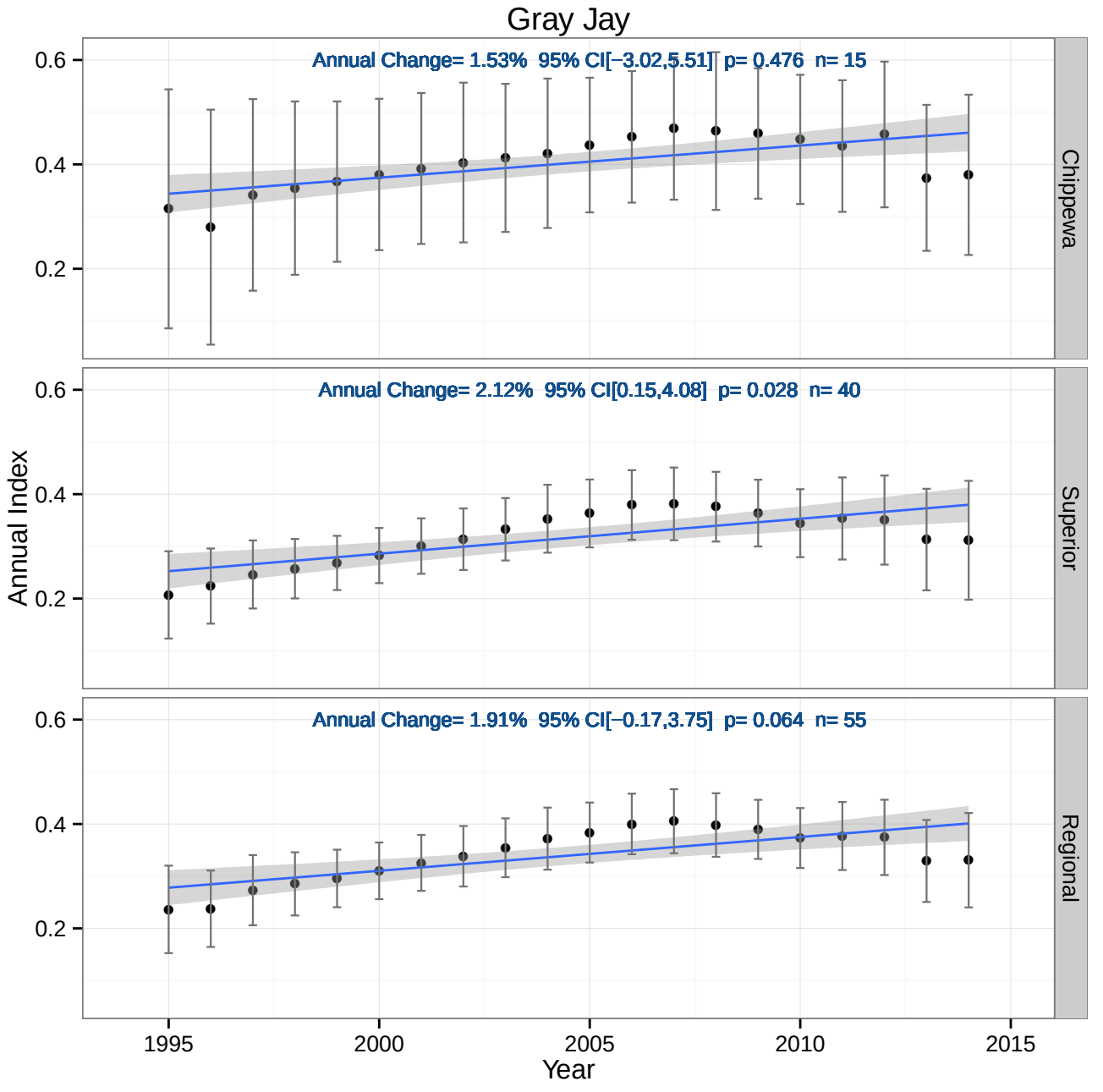

Downy Woodpecker
Annual Change= −2.14% 95% CI[−6.08,1.52] p= 0.28 n= 16
Annual Change= −9.14% 95% CI[−13.77,−1.68] p= 0.032 n= 6
Annual Change= −3.83% 95% CI[−7.34,−0.07] p= 0.044 n= 22
Chippewa
Superior
Regional
Annual Index
Year
0.6
0.4
0.2
0.0
−0.2
1995
2000
2005
2010
2015

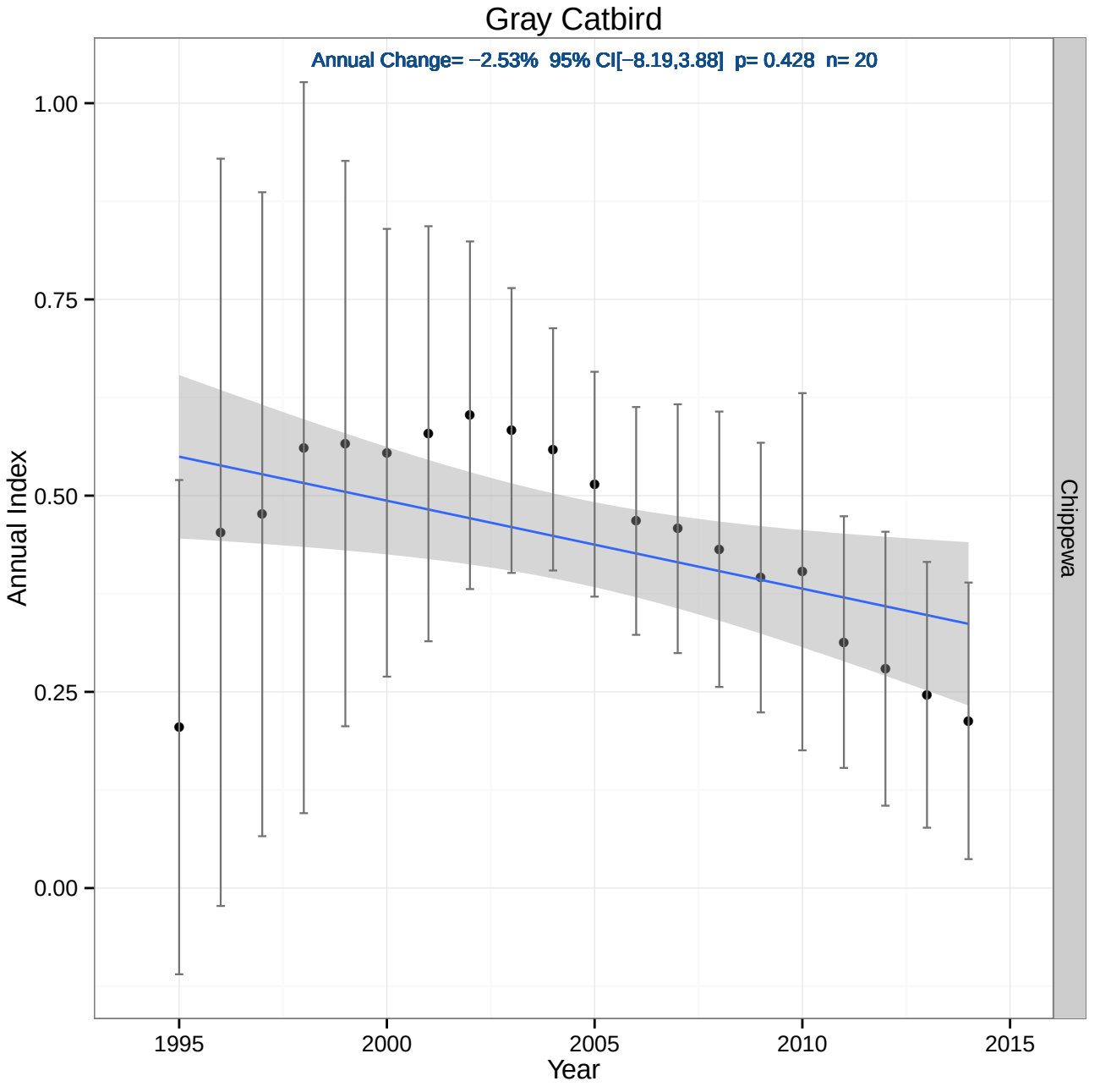

Eastern Wood−Pewee
Annual Change= −0.93% 95% CI[−2.08,0.14] p= 0.084 n= 89
Annual Change= −0.92% 95% CI[−4.54,2.93] p= 0.544 n= 27
Annual Change= −0.94% 95% CI[−2.07,0.01] p= 0.052 n= 116
Chippewa
Superior
Regional
Annual Index
1.00
0.75
0.50
0.25
1995
2000
2005
2010
2015
Year

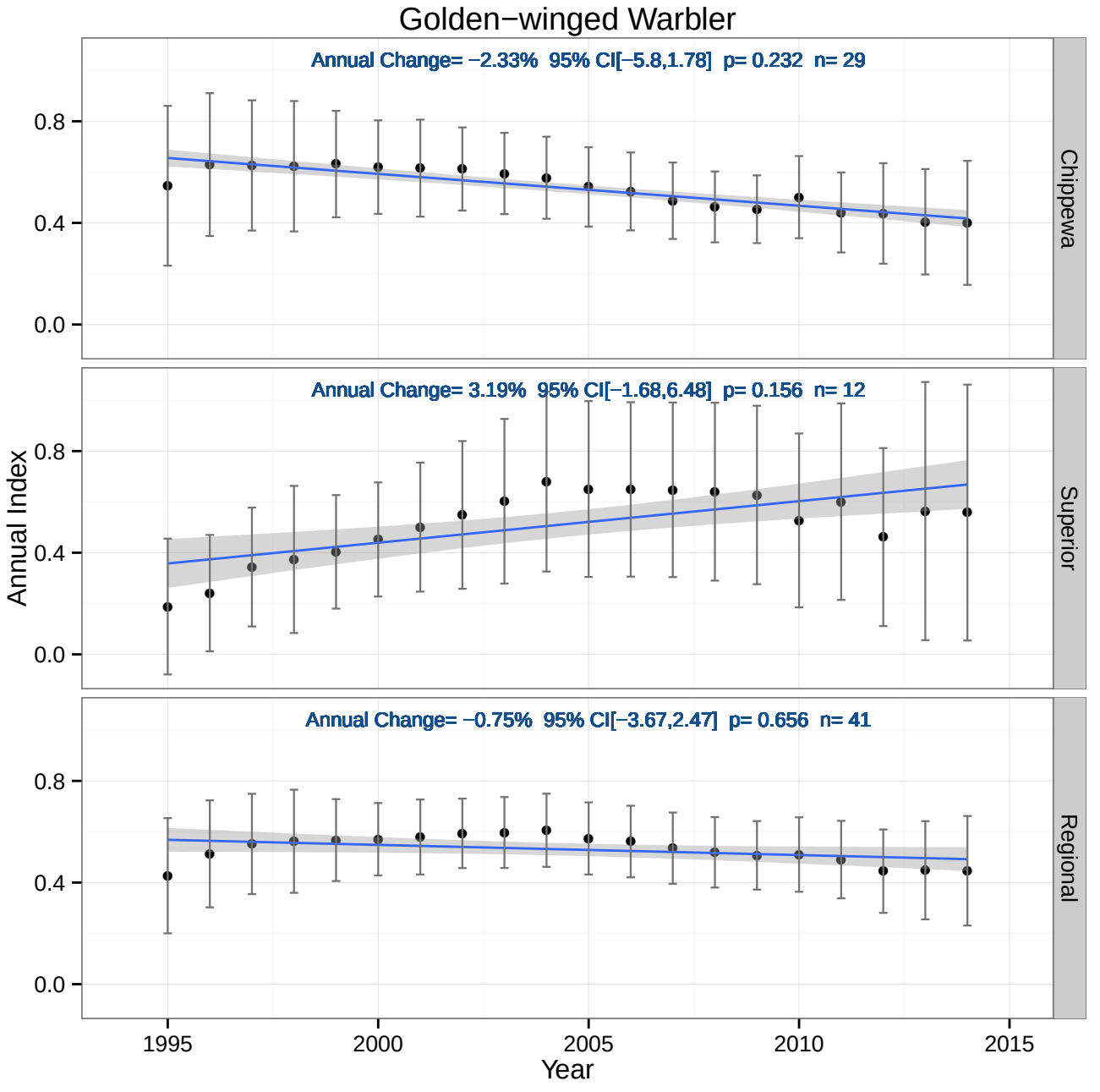

Evening Grosbeak
Annual Change= −9.57% 95% CI[−15.39,−3.15] p= 0.004 n= 10
Annual Index
0.0
0.2
0.4
0.6
1995
2000
2005
2010
2015
Year
Superior

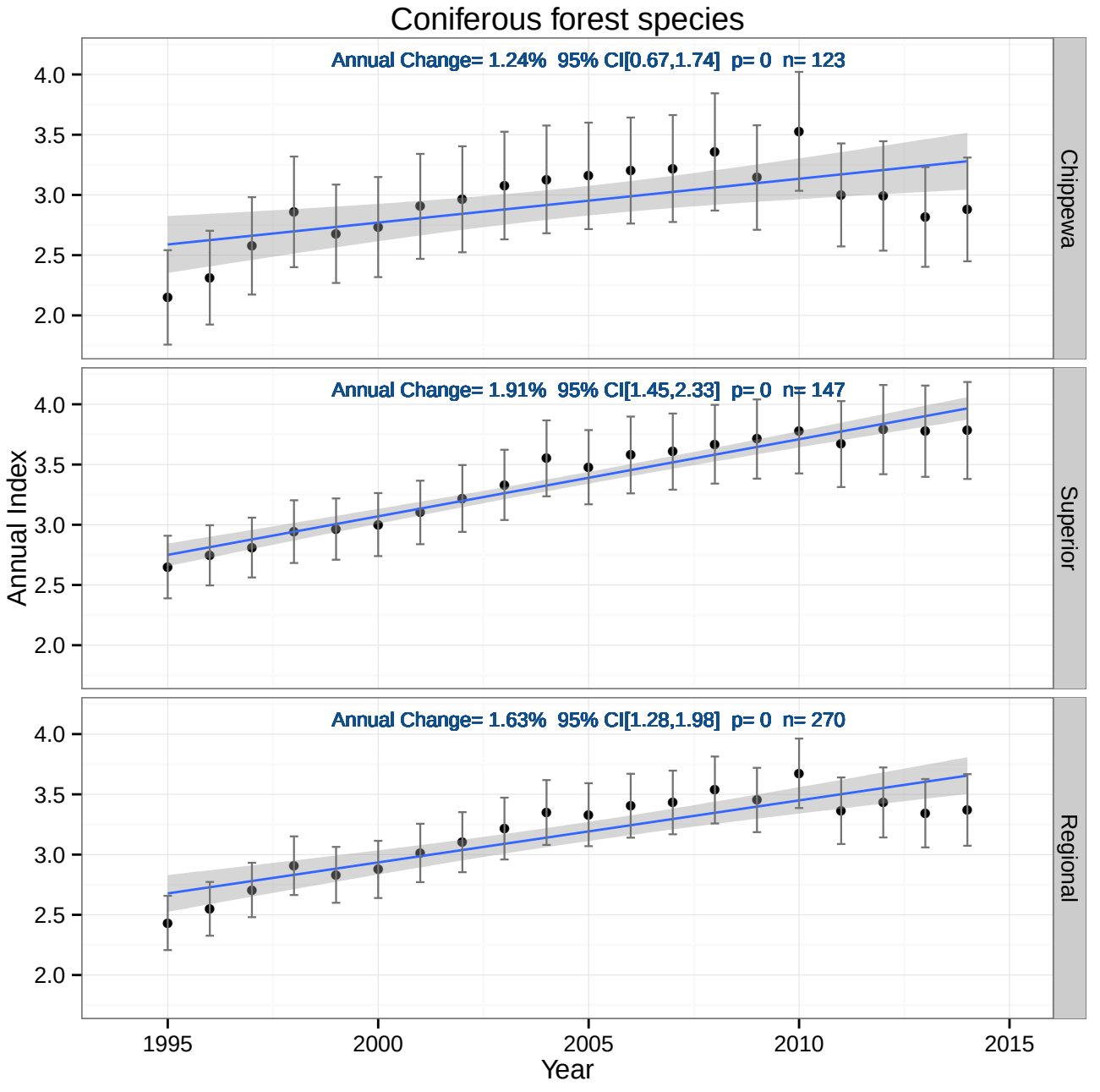

Great Crested Flycatcher
Annual Change= −2.04% 95% CI[−4.19,0.44] p= 0.104 n= 41
Annual Index
0.40
0.35
0.30
0.25
0.20
0.15
1995
2000
2005
2010
2015
Year
Chippewa

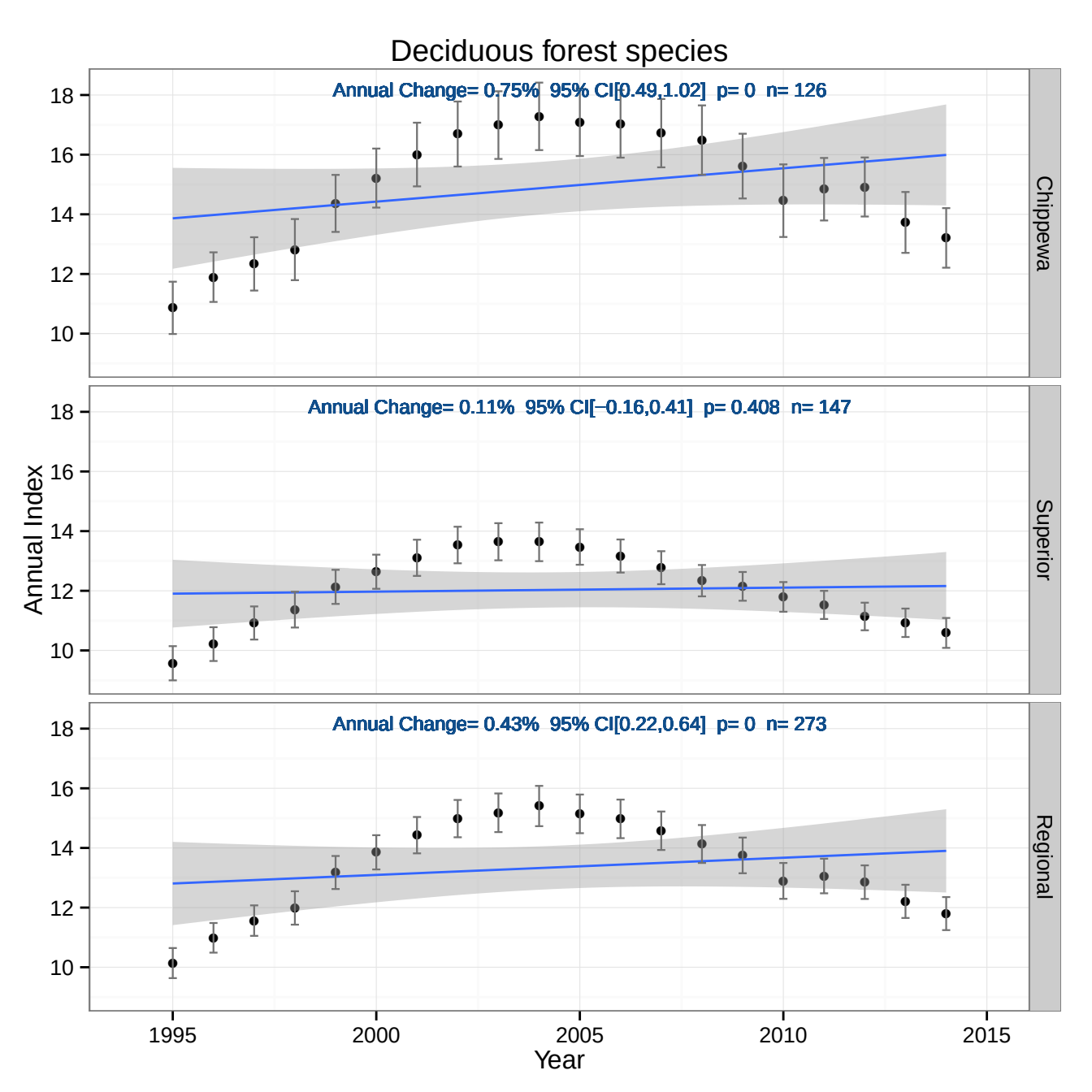

Golden−crowned Kinglet
Annual Change= −0.19% 95% CI[−2.42,2.1] p= 0.864 n= 24
Annual Change= 3.25% 95% CI[1.83,4.78] p= 0 n= 73
Annual Change= 2.42% 95% CI[1.12,3.79] p= 0 n= 97
Chippewa
Superior
Regional
Annual Index
0.2
0.4
0.6
0.8
1995
2000
2005
2010
2015
Year

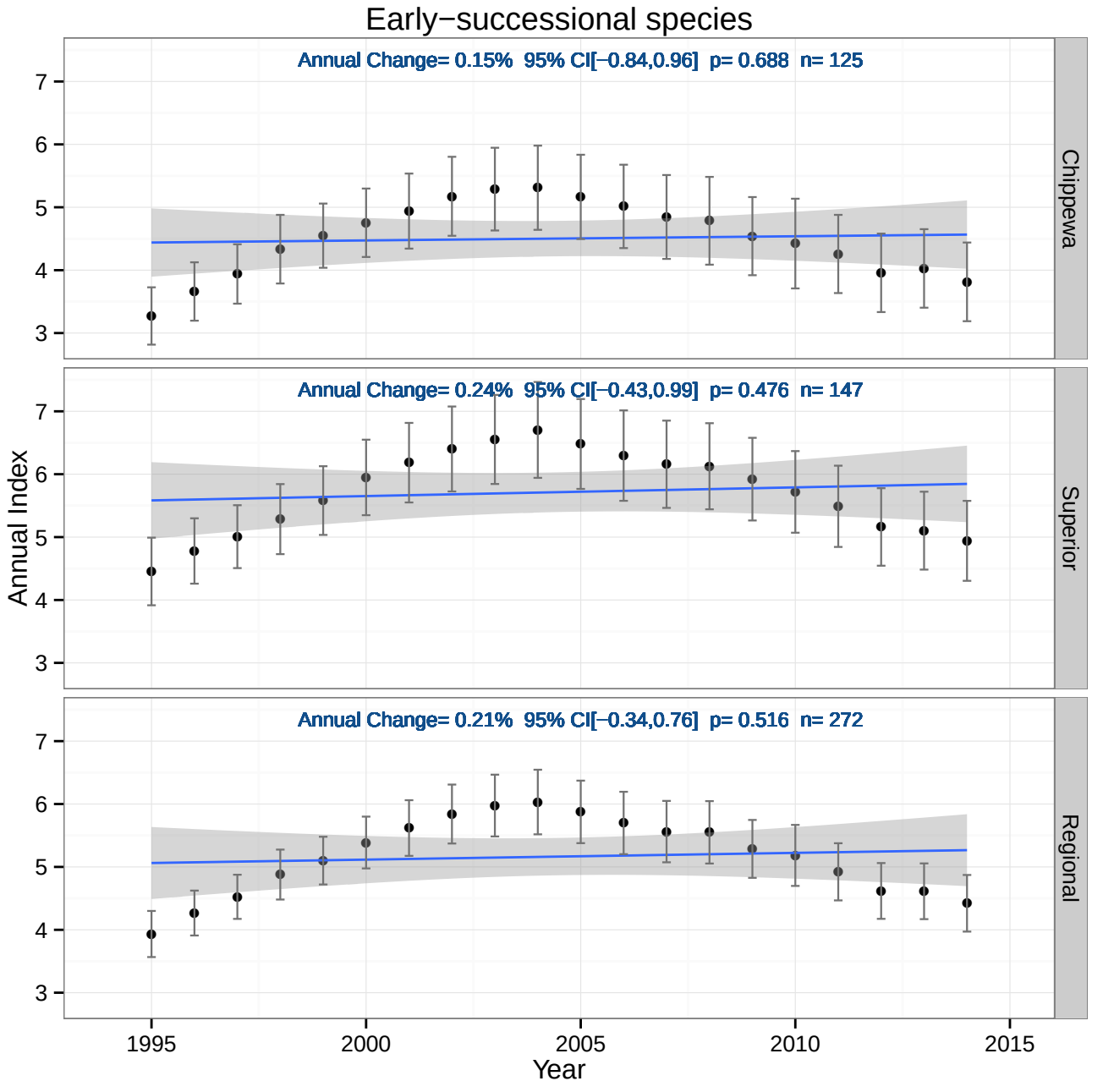

Gray Jay
Annual Change= 1.53% 95% CI[−3.02,5.51] p= 0.476 n= 15
Annual Change= 2.12% 95% CI[0.15,4.08] p= 0.028 n= 40
Annual Change= 1.91% 95% CI[−0.17,3.75] p= 0.064 n= 55
Chippewa
Superior
Regional
Annual Index
0.6
0.4
0.2
1995
2000
2005
2010
2015
Year

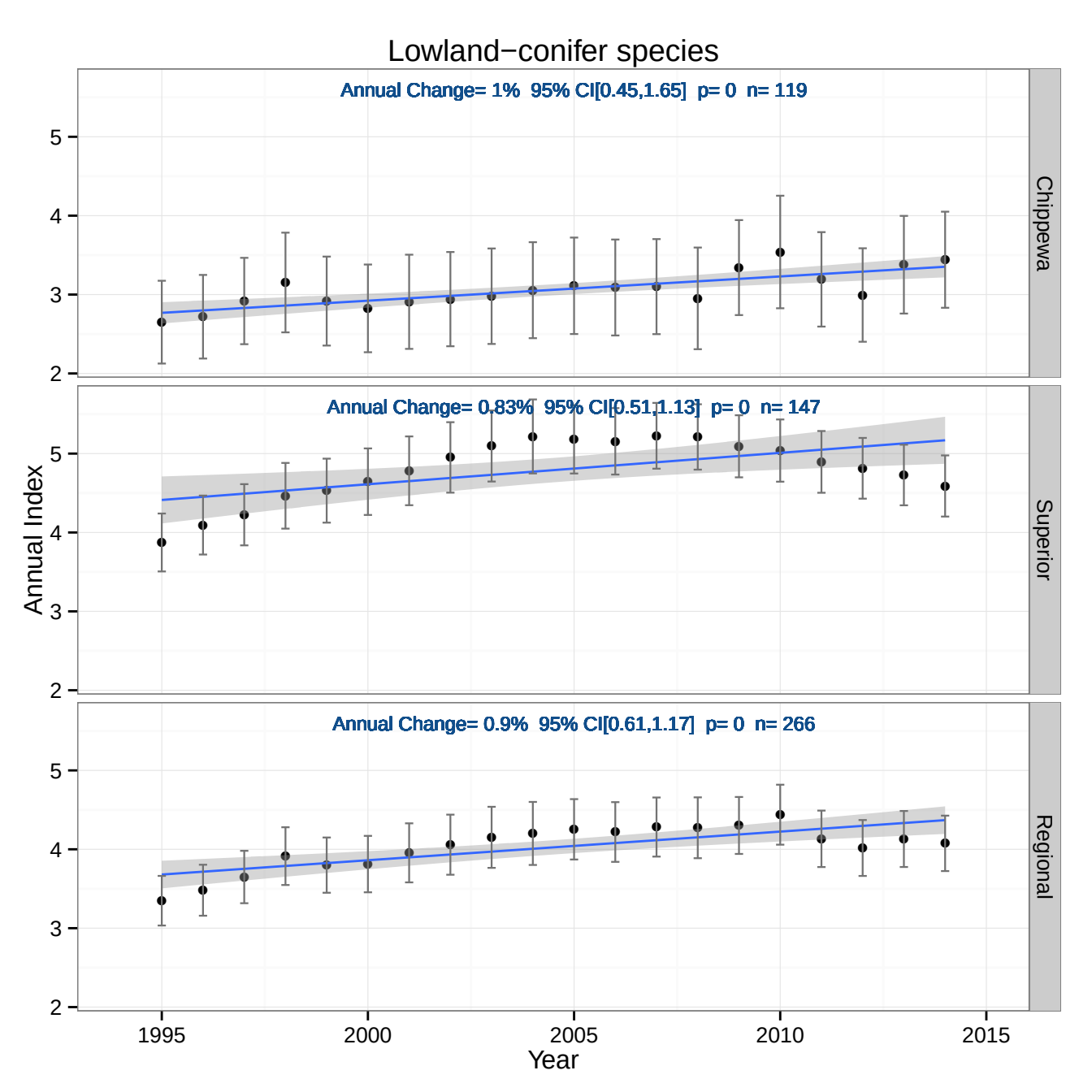

Gray Catbird
Annual Change= −2.53% 95% CI[−8.19,3.88] p= 0.428 n= 20
Annual Index
1.00
0.75
0.50
0.25
0.00
1995
2000
2005
2010
2015
Year
Chippewa

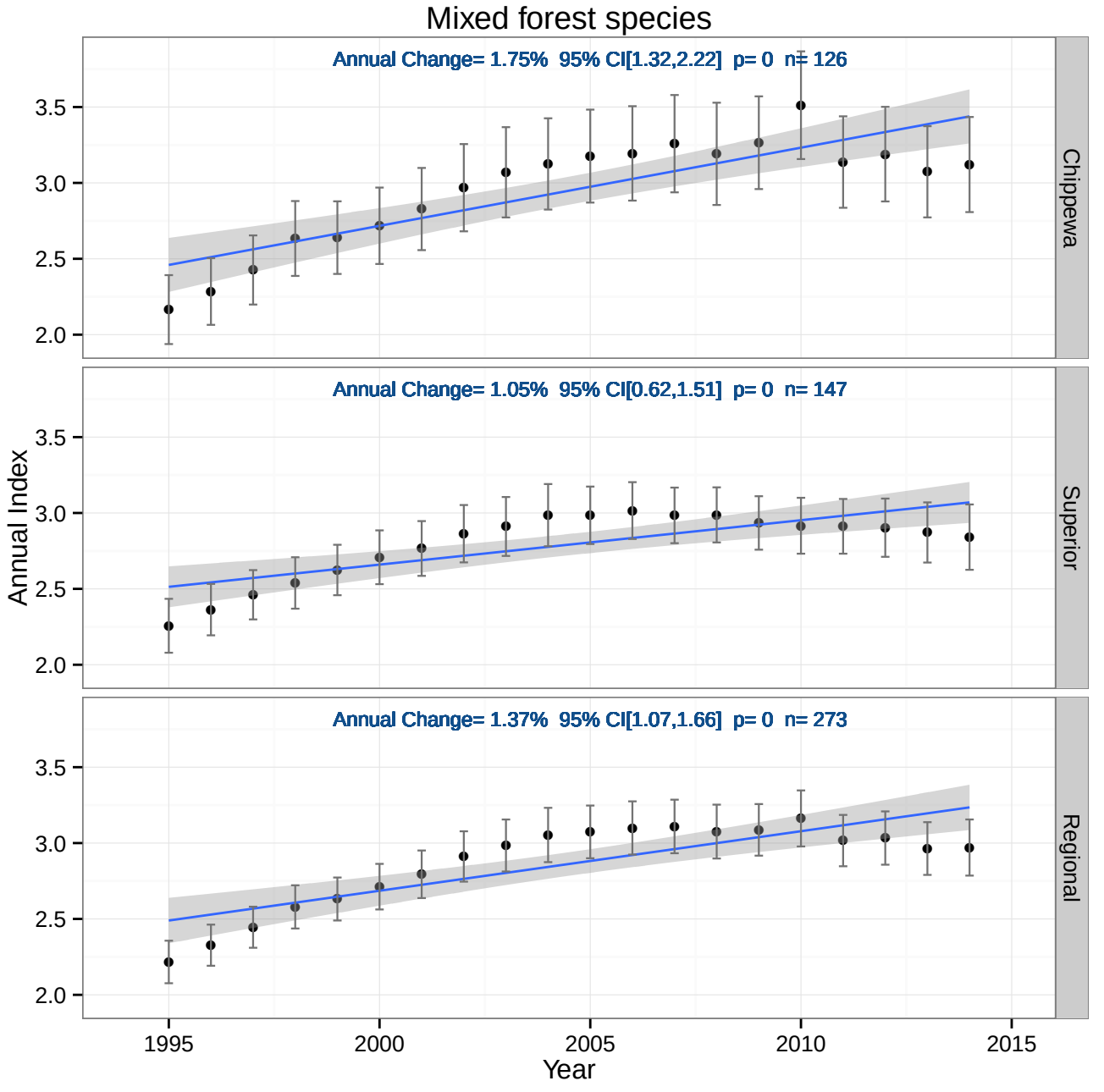

Golden−winged Warbler
Annual Change= −2.33% 95% CI[−5.8,1.78] p= 0.232 n= 29
Annual Change= 3.19% 95% CI[−1.68,6.48] p= 0.156 n= 12
Annual Change= −0.75% 95% CI[−3.67,2.47] p= 0.656 n= 41
Chippewa
Superior
Regional
Annual Index
0.0
0.4
0.8
1995
2000
2005
2010
2015
Year

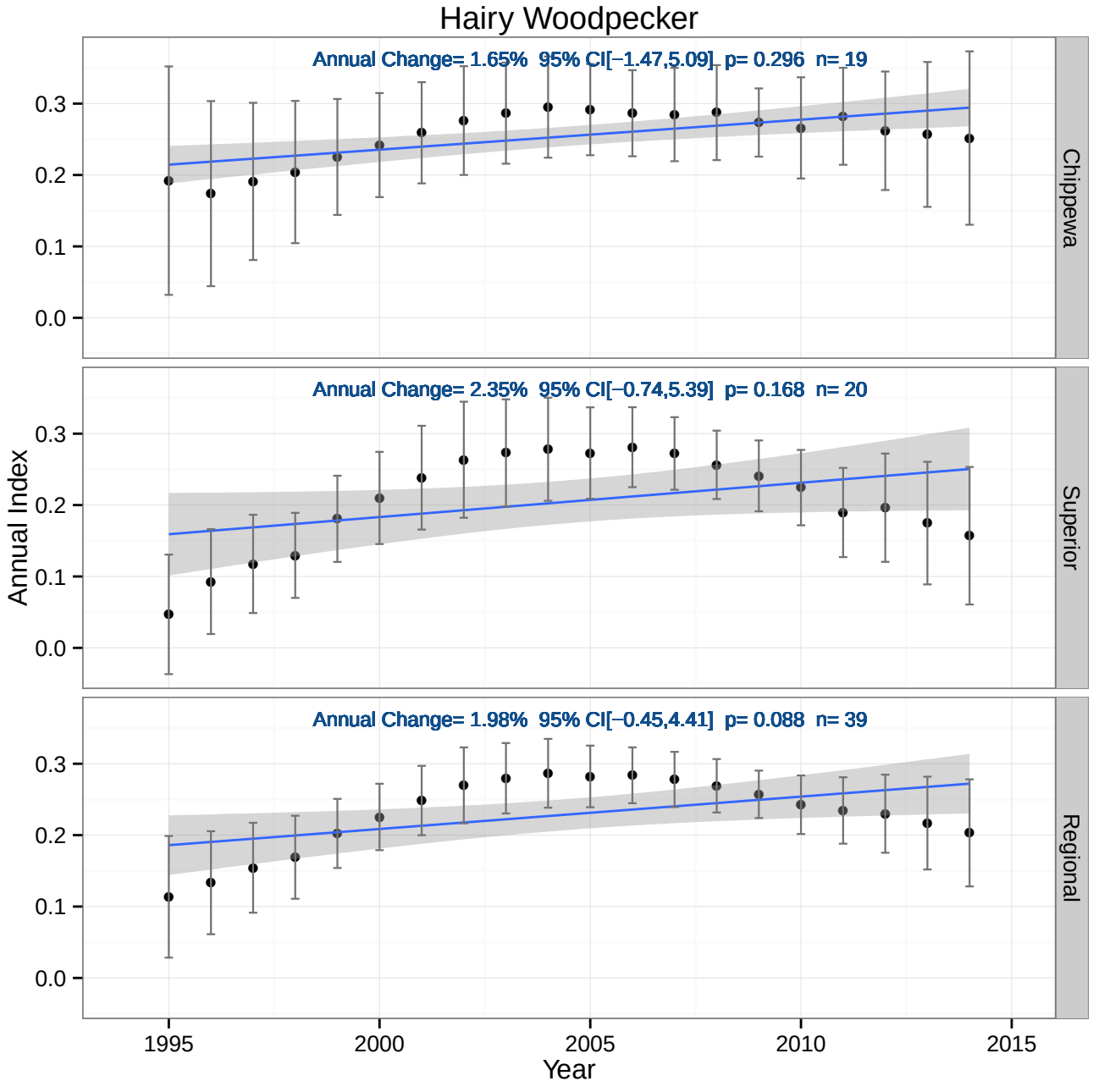

Coniferous forest species
Annual Change= 1.24% 95% CI[0.67,1.74] p= 0 n= 123
Annual Change= 1.91% 95% CI[1.45,2.33] p= 0 n= 147
Annual Change= 1.63% 95% CI[1.28,1.98] p= 0 n= 270
Chippewa
Superior
Regional
Annual Index
Year
4.0
3.5
3.0
2.5
2.0
1995
2000
2005
2010
2015

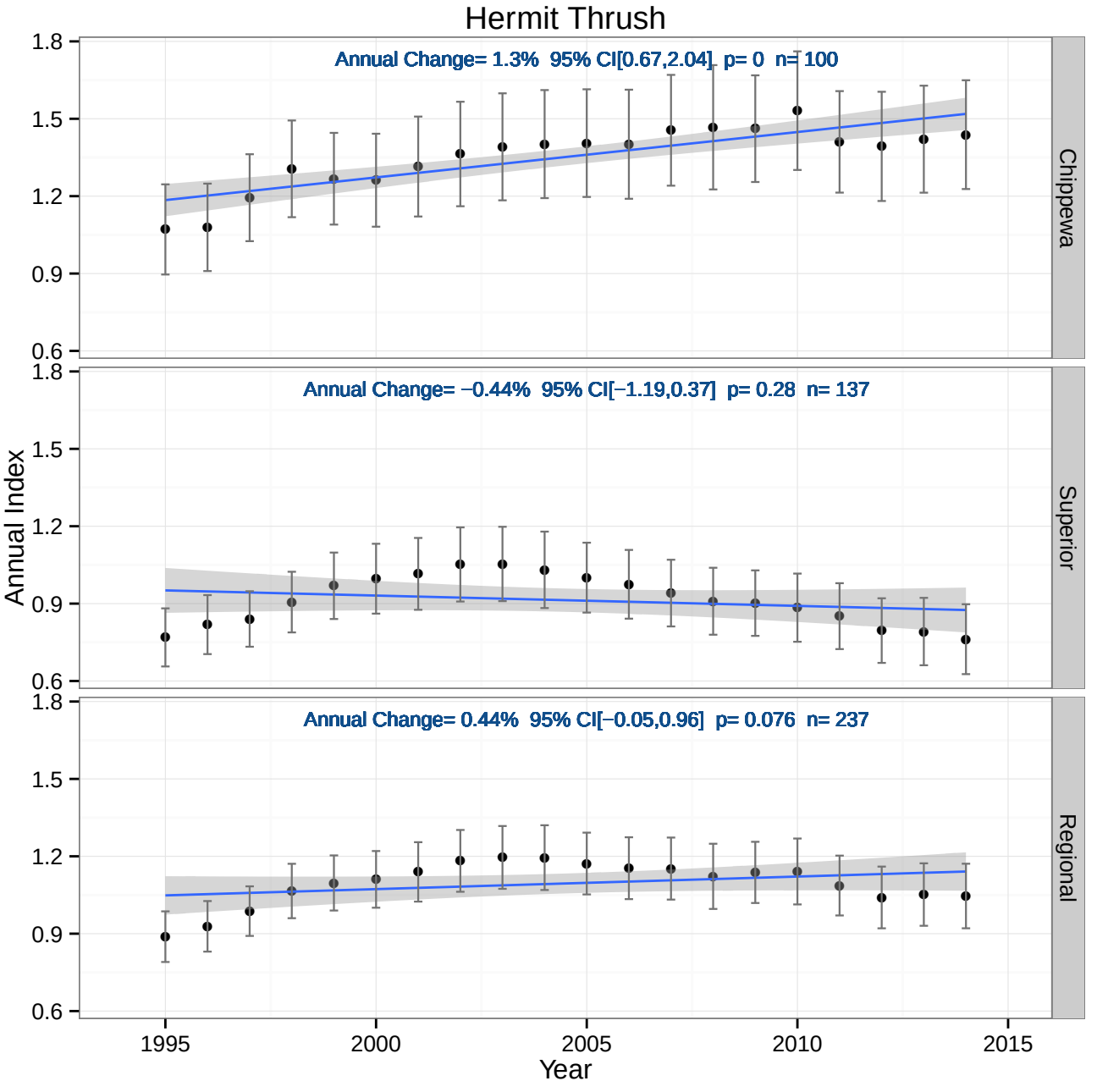

Deciduous forest species
Annual Change= 0.75% 95% CI[0.49,1.02] p= 0 n= 126
Annual Change= 0.11% 95% CI[−0.16,0.41] p= 0.408 n= 147
Annual Change= 0.43% 95% CI[0.22,0.64] p= 0 n= 273
Chippewa
Superior
Regional
Annual Index
Year
18
16
14
12
10
1995
2000
2005
2010
2015

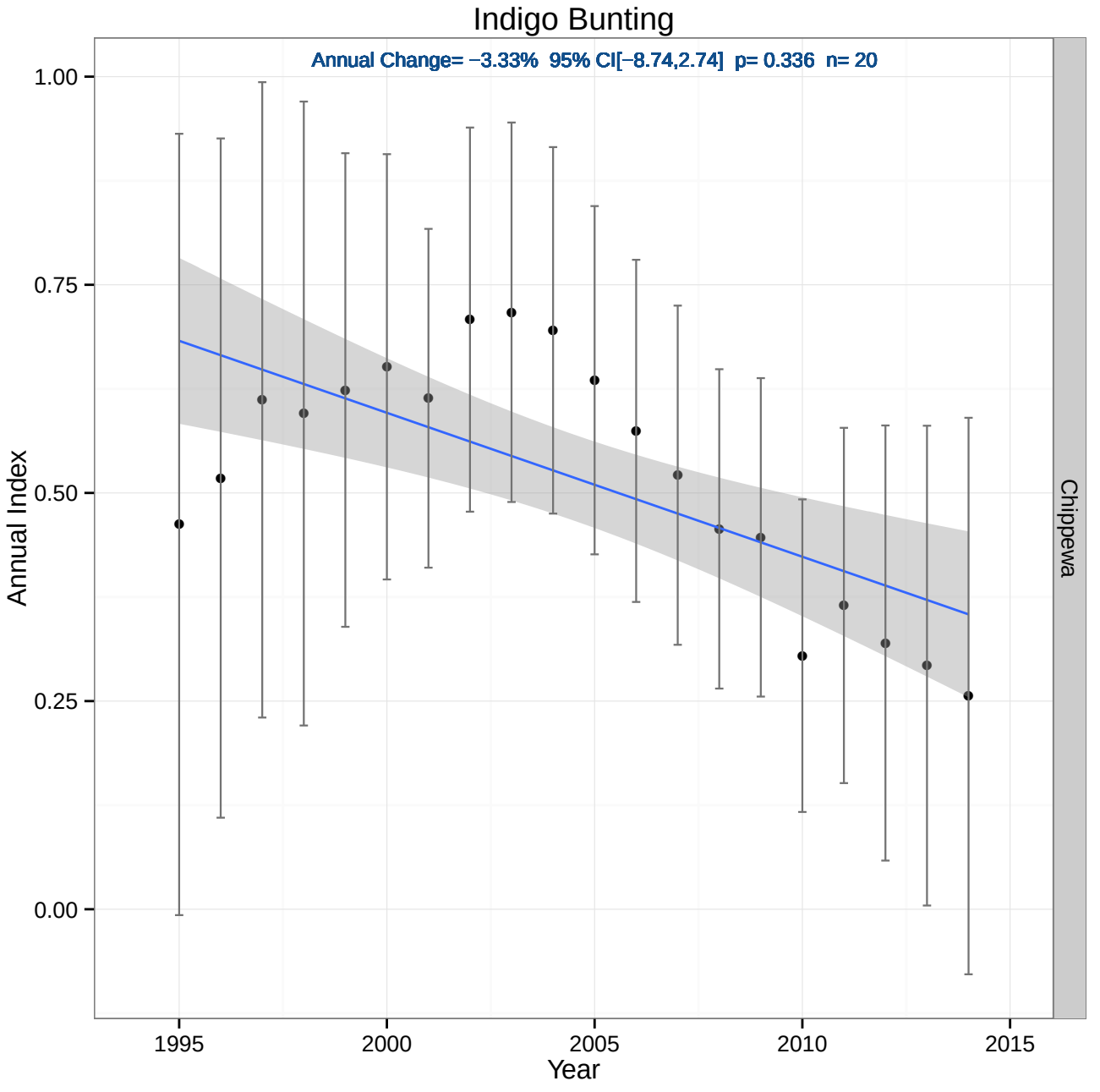

Early−successional species
Annual Change= 0.15% 95% CI[−0.84,0.96] p= 0.688 n= 125
Annual Change= 0.24% 95% CI[−0.43,0.99] p= 0.476 n= 147
Annual Change= 0.21% 95% CI[−0.34,0.76] p= 0.516 n= 272
Chippewa
Superior
Regional
Annual Index
Year
1995
2000
2005
2010
2015
3
4
5
6
7

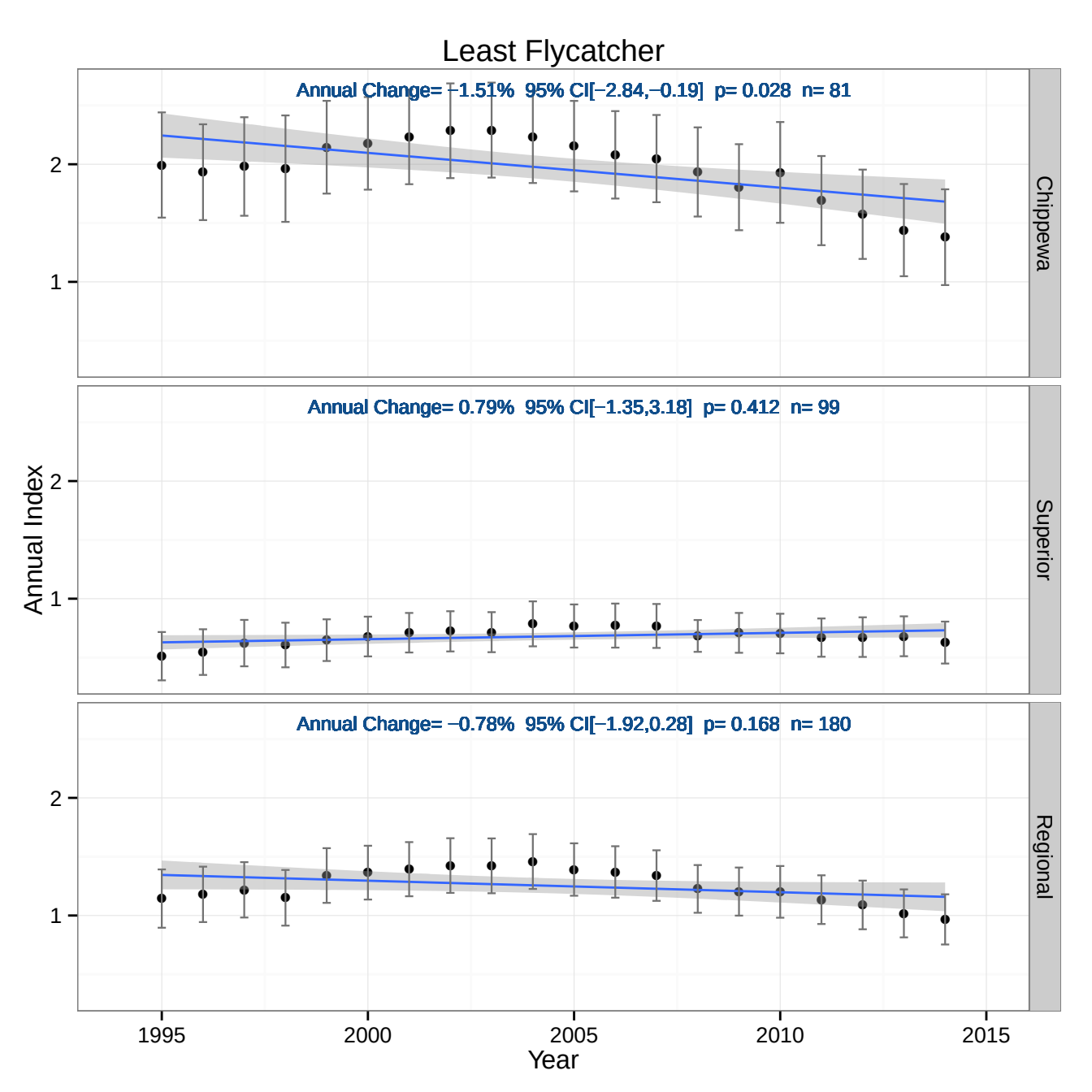

Lowland−conifer species
Annual Change= 1% 95% CI[0.45,1.65] p= 0 n= 119
Chippewa
Annual Change= 0.83% 95% CI[0.51,1.13] p= 0 n= 147
Superior
Annual Change= 0.9% 95% CI[0.61,1.17] p= 0 n= 266
Regional
Annual Index
Year
2
3
4
5
1995
2000
2005
2010
2015

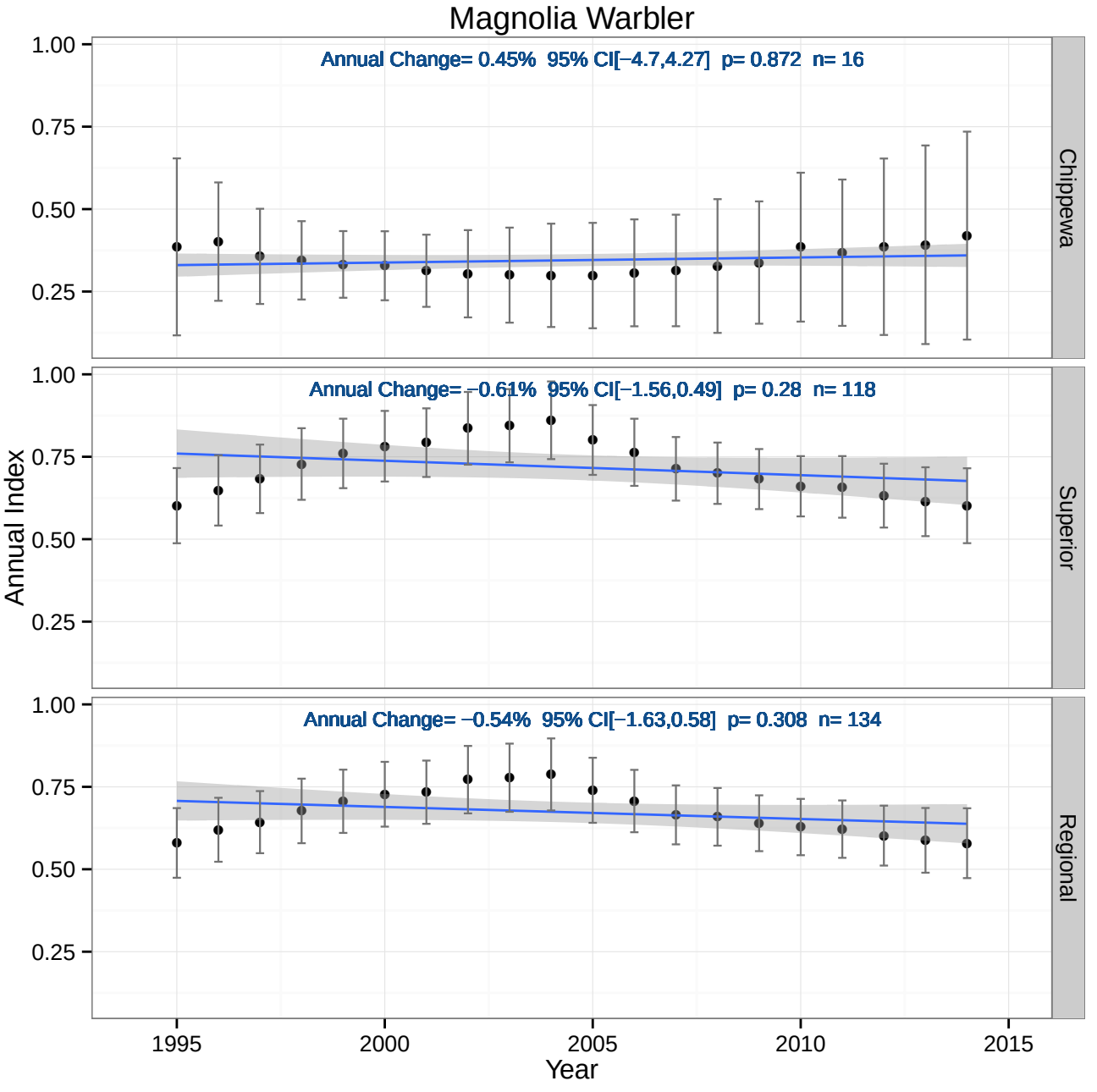

Mixed forest species
Annual Change= 1.75% 95% CI[1.32,2.22] p= 0 n= 126
Annual Change= 1.05% 95% CI[0.62,1.51] p= 0 n= 147
Annual Change= 1.37% 95% CI[1.07,1.66] p= 0 n= 273
Chippewa
Superior
Regional
Annual Index
Year
2.0
2.5
3.0
3.5
1995
2000
2005
2010
2015

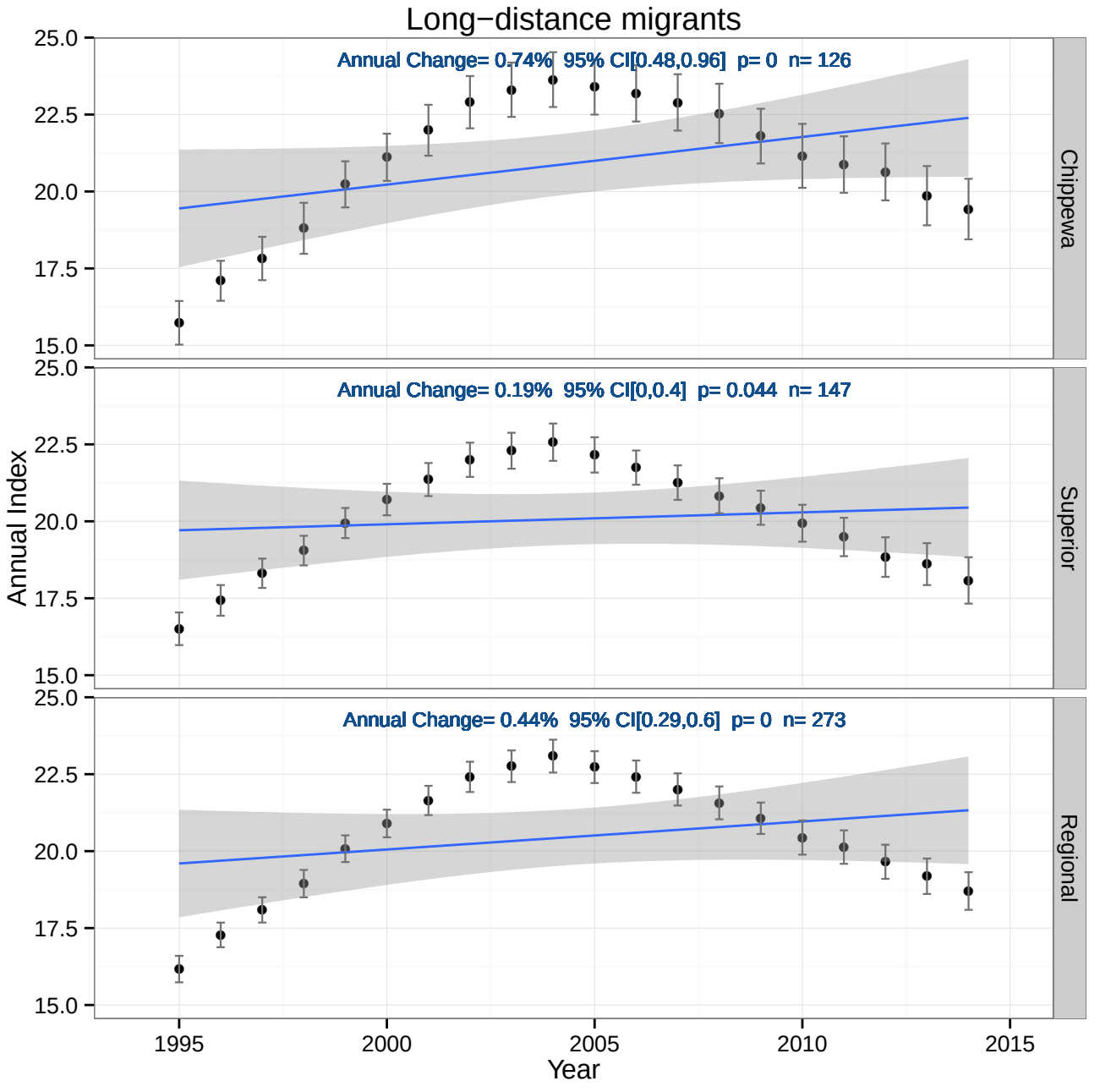

Hairy Woodpecker
Annual Change= 1.65% 95% CI[−1.47,5.09] p= 0.296 n= 19
Annual Change= 2.35% 95% CI[−0.74,5.39] p= 0.168 n= 20
Annual Change= 1.98% 95% CI[−0.45,4.41] p= 0.088 n= 39
Chippewa
Superior
Regional
Annual Index
0.0
0.1
0.2
0.3
1995
2000
2005
2010
2015
Year

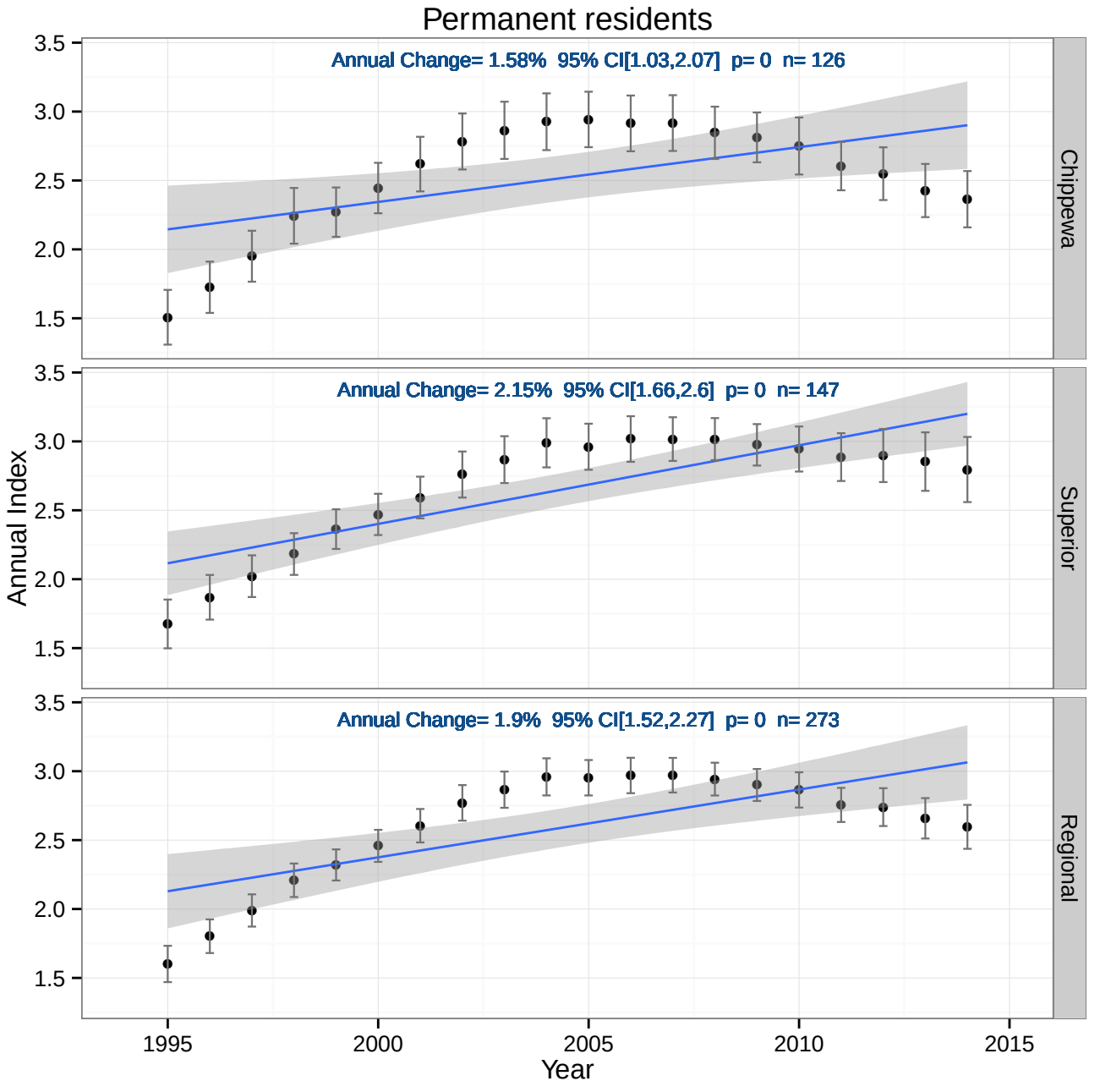

Hermit Thrush
Annual Change= 1.3% 95% CI[0.67,2.04] p= 0 n= 100
Annual Change= −0.44% 95% CI[−1.19,0.37] p= 0.28 n= 137
Annual Change= 0.44% 95% CI[−0.05,0.96] p= 0.076 n= 237
Chippewa
Superior
Regional
Annual Index
Year
1.8
1.5
1.2
0.9
0.6
1995
2000
2005
2010
2015

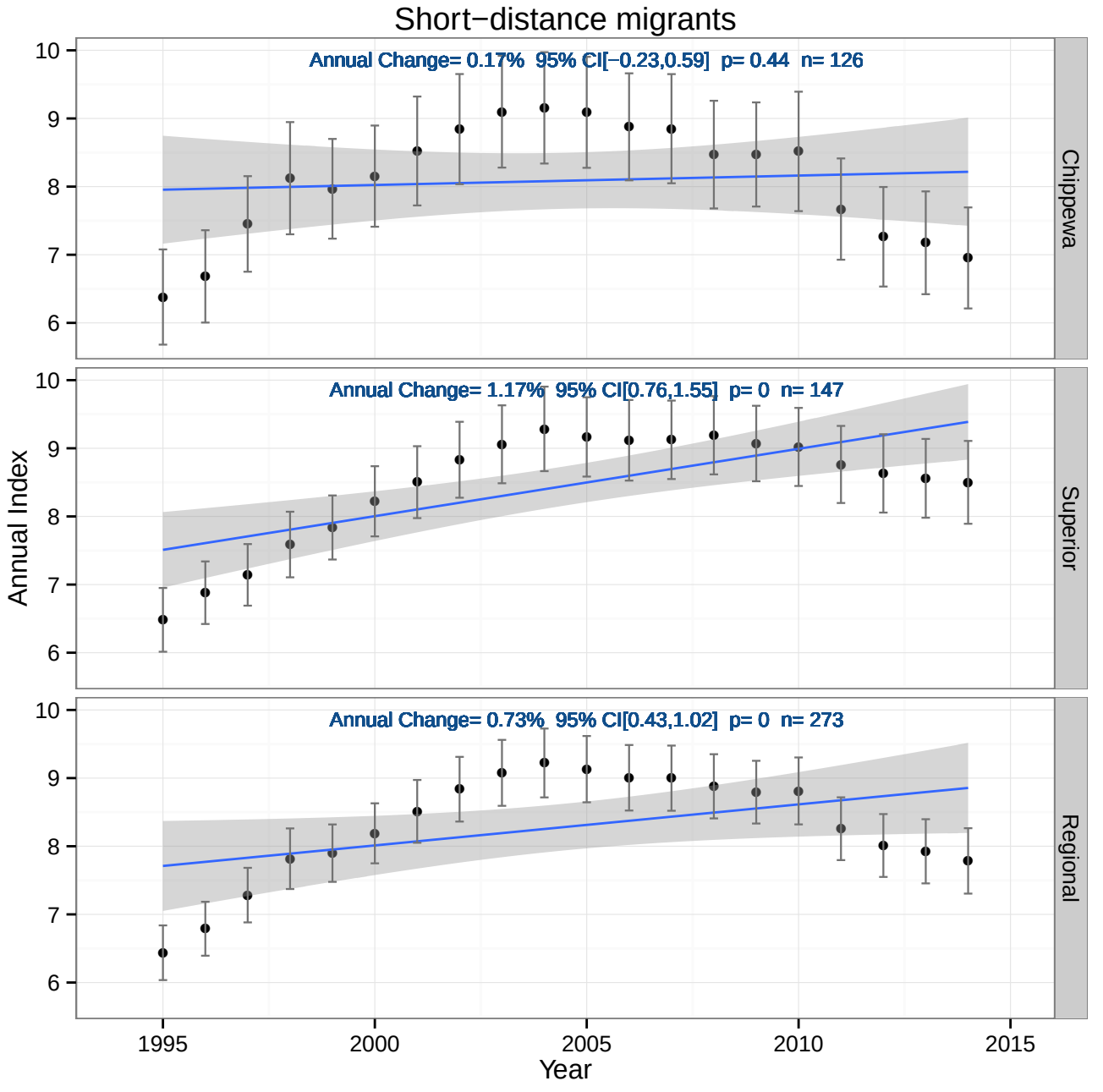

Indigo Bunting
Annual Change= −3.33% 95% CI[−8.74,2.74] p= 0.336 n= 20
1.00
0.75
0.50
0.25
0.00
Annual Index
1995
2000
2005
2010
2015
Year
Chippewa

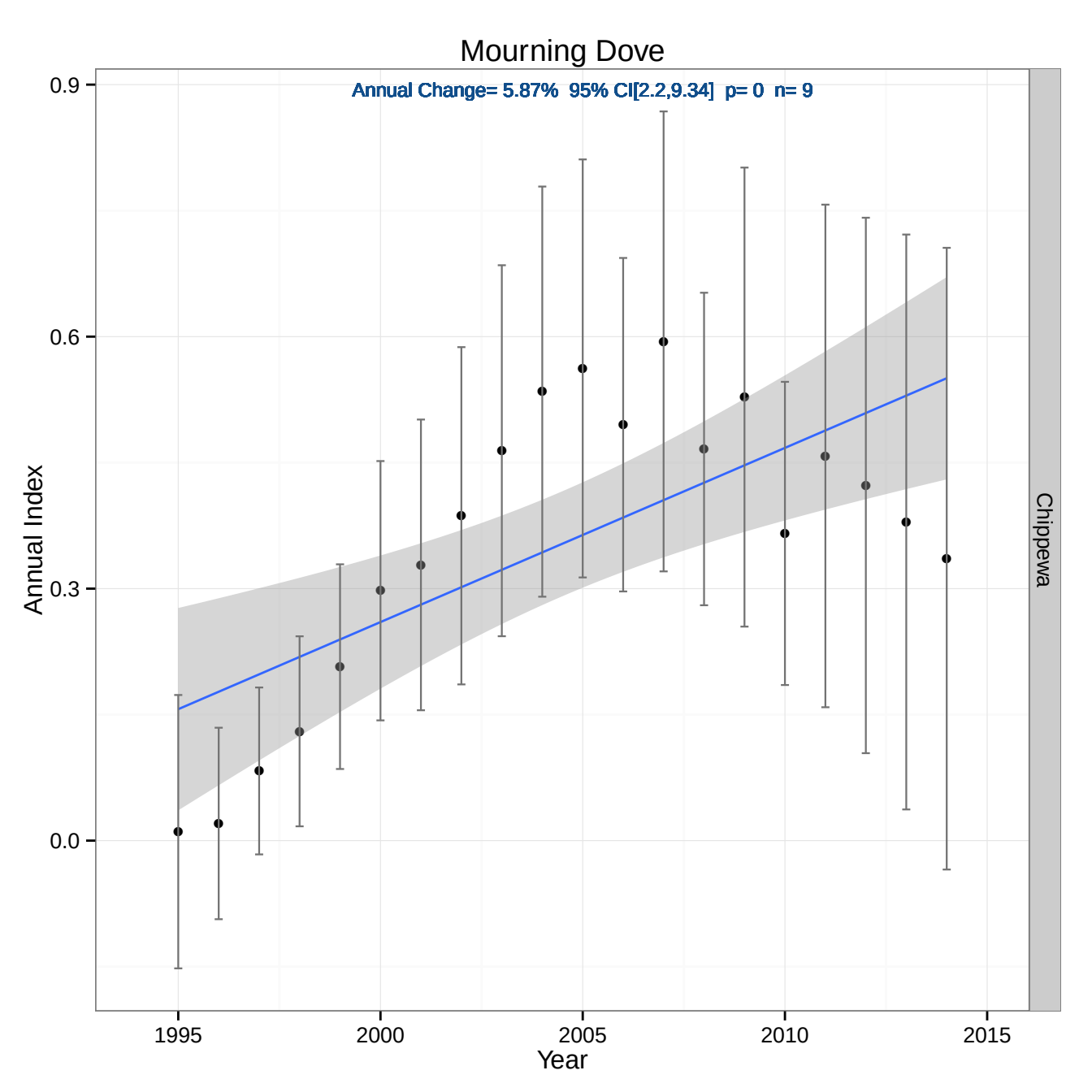

Least Flycatcher
Annual Change= −1.51% 95% CI[−2.84,−0.19] p= 0.028 n= 81
Annual Change= 0.79% 95% CI[−1.35,3.18] p= 0.412 n= 99
Annual Change= −0.78% 95% CI[−1.92,0.28] p= 0.168 n= 180
Chippewa
Superior
Regional
Annual Index
Year
1
2
1995
2000
2005
2010
2015

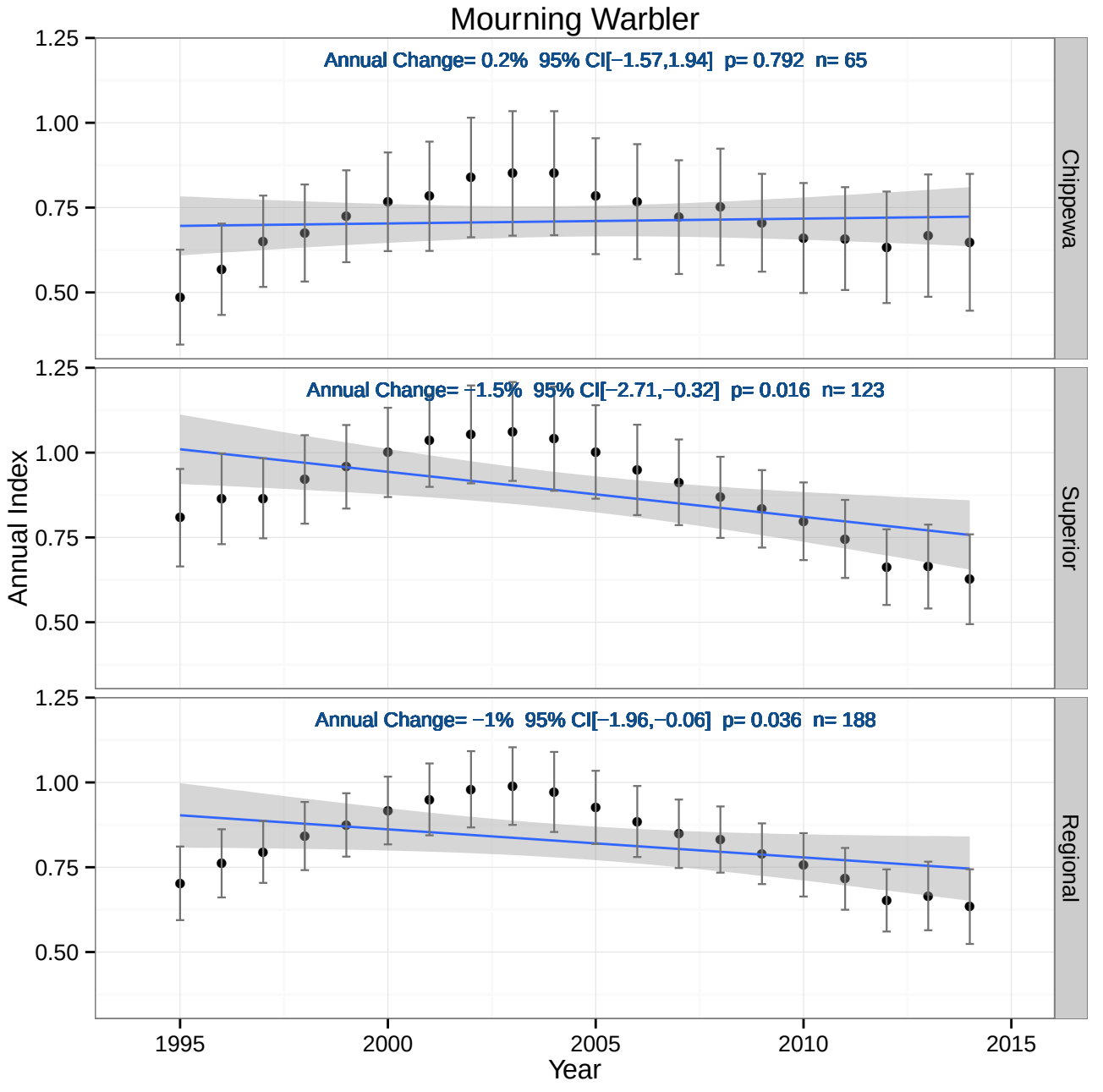

Magnolia Warbler
Annual Change= 0.45% 95% CI[−4.7,4.27] p= 0.872 n= 16
Annual Change= −0.61% 95% CI[−1.56,0.49] p= 0.28 n= 118
Annual Change= −0.54% 95% CI[−1.63,0.58] p= 0.308 n= 134
Chippewa
Superior
Regional
Annual Index
1.00
0.75
0.50
0.25
1995
2000
2005
2010
2015
Year

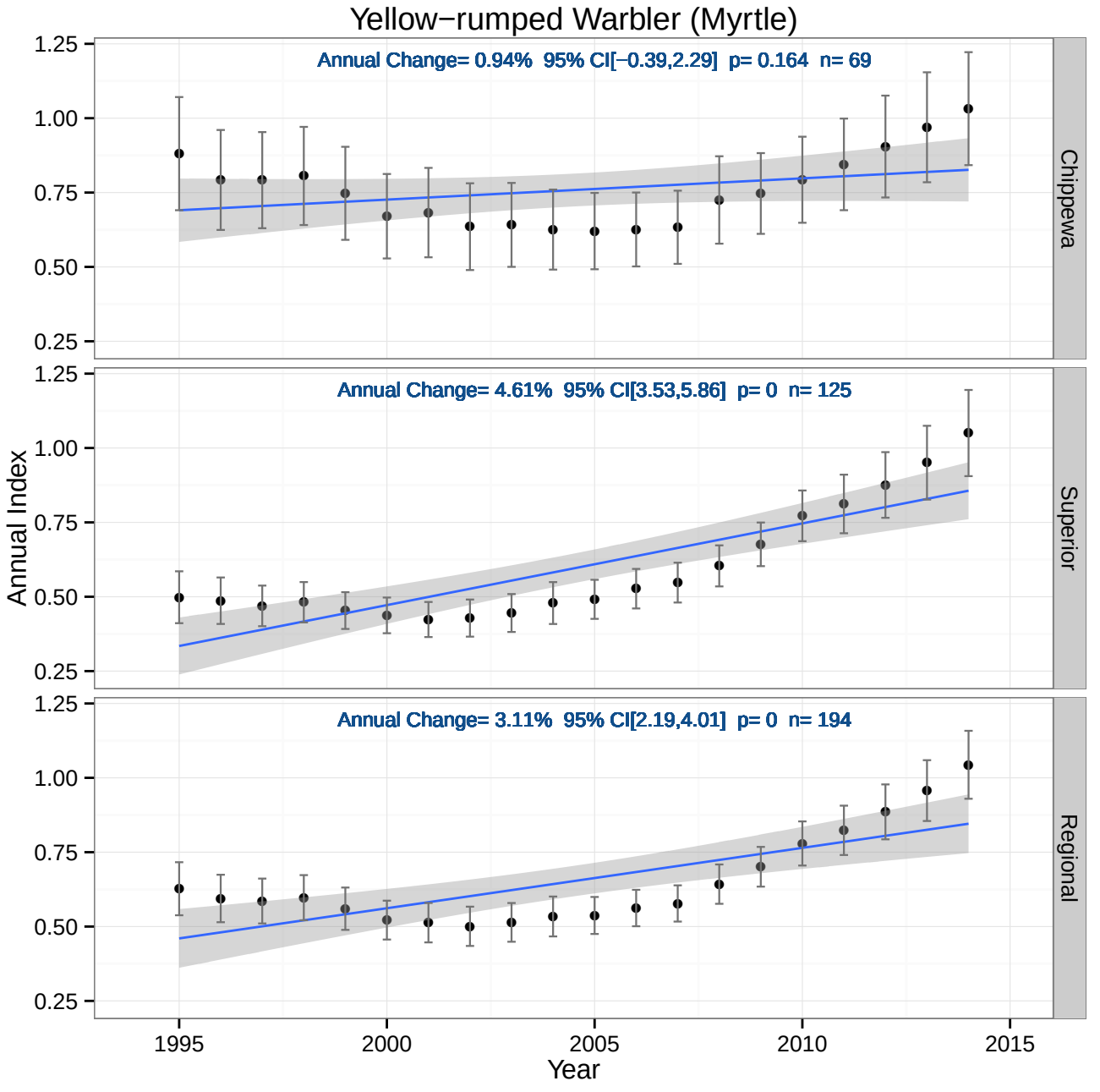

Long−distance migrants
Annual Change= 0.74% 95% CI[0.48,0.96] p= 0 n= 126
Annual Change= 0.19% 95% CI[0,0.4] p= 0.044 n= 147
Annual Change= 0.44% 95% CI[0.29,0.6] p= 0 n= 273
Chippewa
Superior
Regional
Annual Index
Year
25.0
22.5
20.0
17.5
15.0
1995
2000
2005
2010
2015

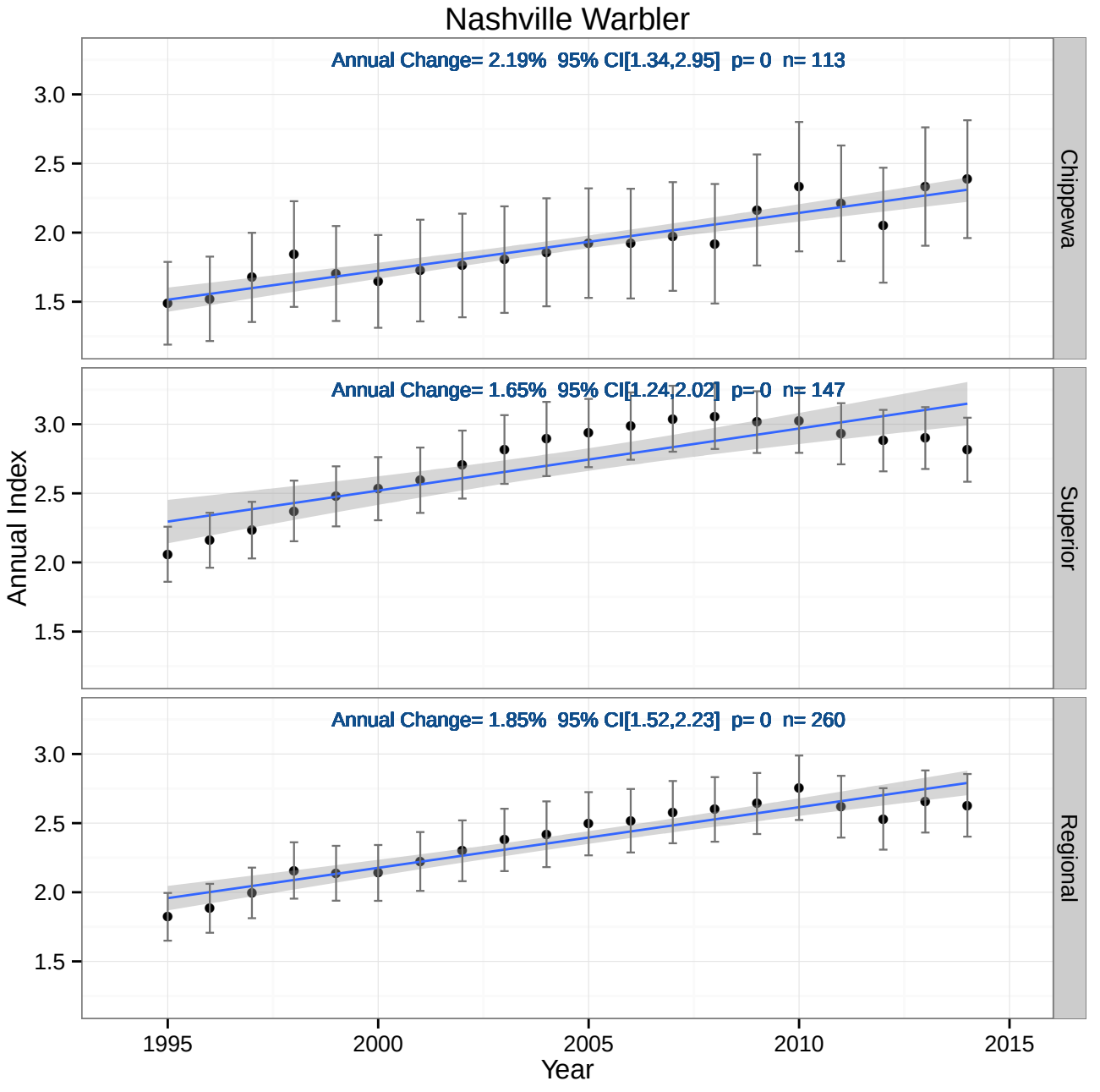

Permanent residents
Annual Change= 1.58% 95% CI[1.03,2.07] p= 0 n= 126
Annual Change= 2.15% 95% CI[1.66,2.6] p= 0 n= 147
Annual Change= 1.9% 95% CI[1.52,2.27] p= 0 n= 273
Chippewa
Superior
Regional
Annual Index
Year
3.5
3.0
2.5
2.0
1.5
1995
2000
2005
2010
2015

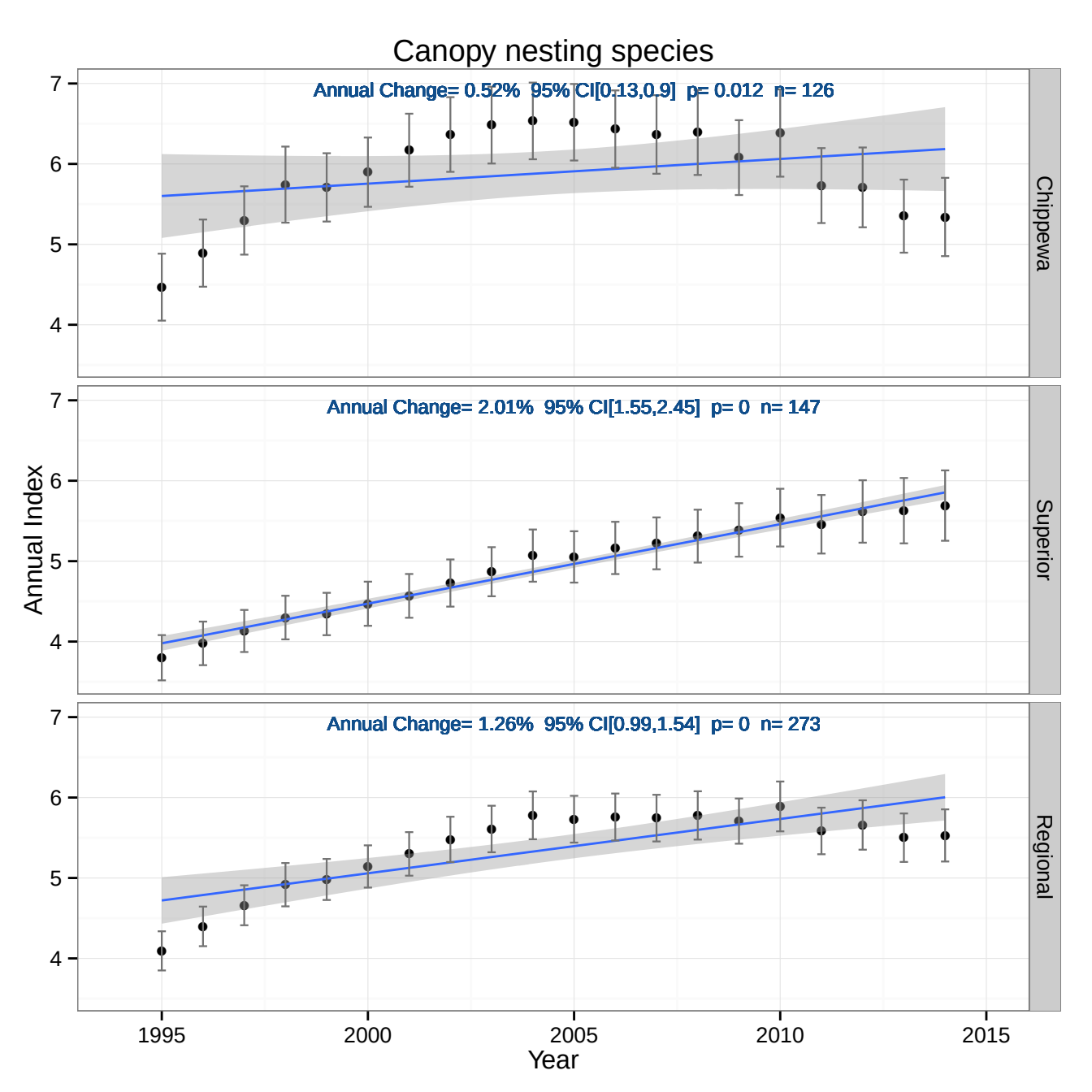

Short−distance migrants
Annual Change= 0.17% 95% CI[−0.23,0.59] p= 0.44 n= 126
Annual Change= 1.17% 95% CI[0.76,1.55] p= 0 n= 147
Annual Change= 0.73% 95% CI[0.43,1.02] p= 0 n= 273
Chippewa
Superior
Regional
Annual Index
Year
10
9
8
7
6
1995
2000
2005
2010
2015

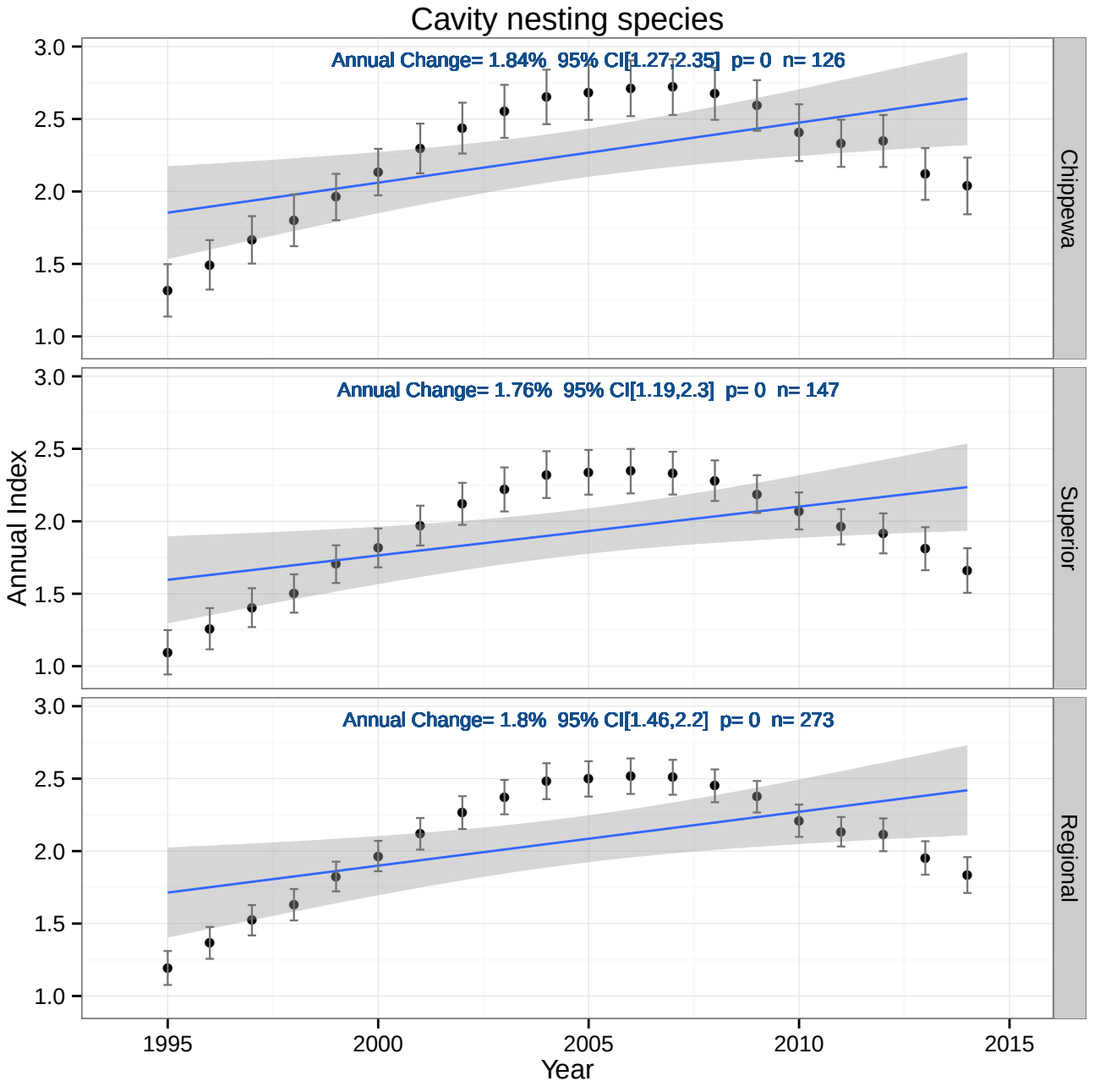

Mourning Dove
Annual Change= 5.87% 95% CI[2.2,9.34] p= 0 n= 9
0.9
0.6
0.3
0.0
Annual Index
1995
2000
2005
2010
2015
Year
Chippewa

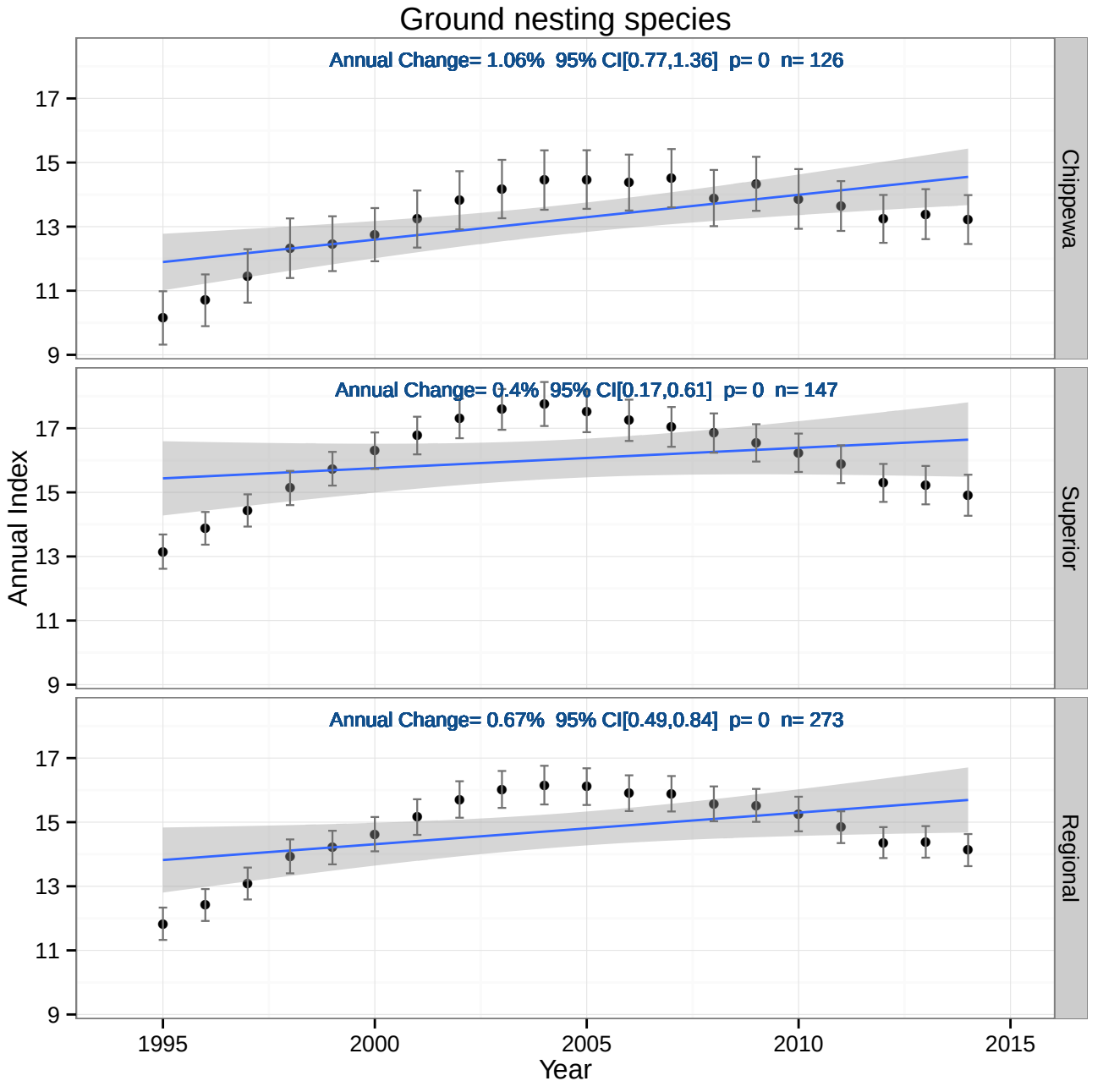

Mourning Warbler
Annual Change= 0.2% 95% CI[−1.57,1.94] p= 0.792 n= 65
Annual Change= −1.5% 95% CI[−2.71,−0.32] p= 0.016 n= 123
Annual Change= −1% 95% CI[−1.96,−0.06] p= 0.036 n= 188
Chippewa
Superior
Regional
Annual Index
1.25
1.00
0.75
0.50
1995
2000
2005
2010
2015
Year

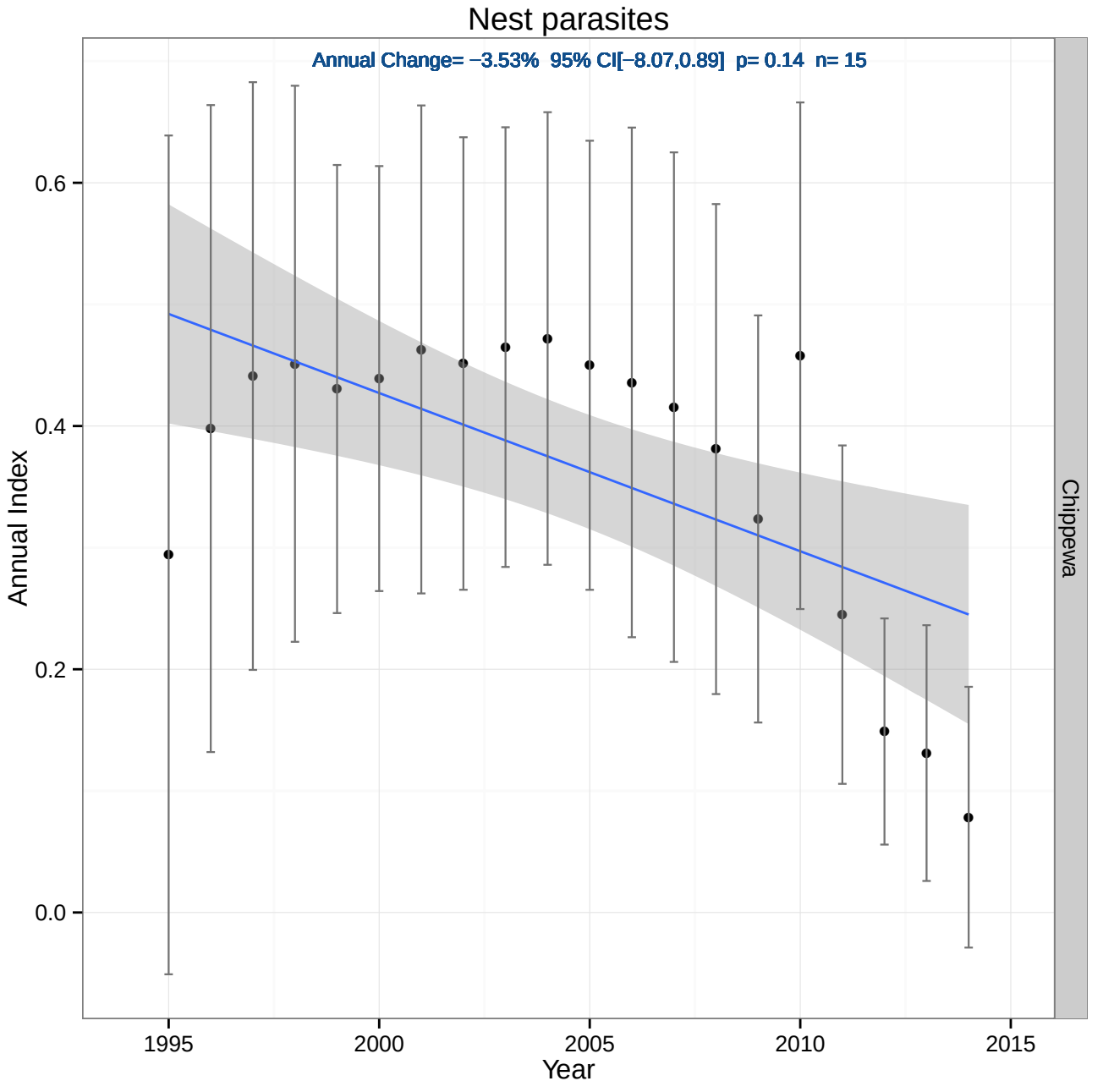

Yellow−rumped Warbler (Myrtle)
Annual Change= 0.94% 95% CI[−0.39,2.29] p= 0.164 n= 69
Annual Change= 4.61% 95% CI[3.53,5.86] p= 0 n= 125
Annual Change= 3.11% 95% CI[2.19,4.01] p= 0 n= 194
Chippewa
Superior
Regional
Annual Index
Year
1.25
1.00
0.75
0.50
0.25
1995
2000
2005
2010
2015

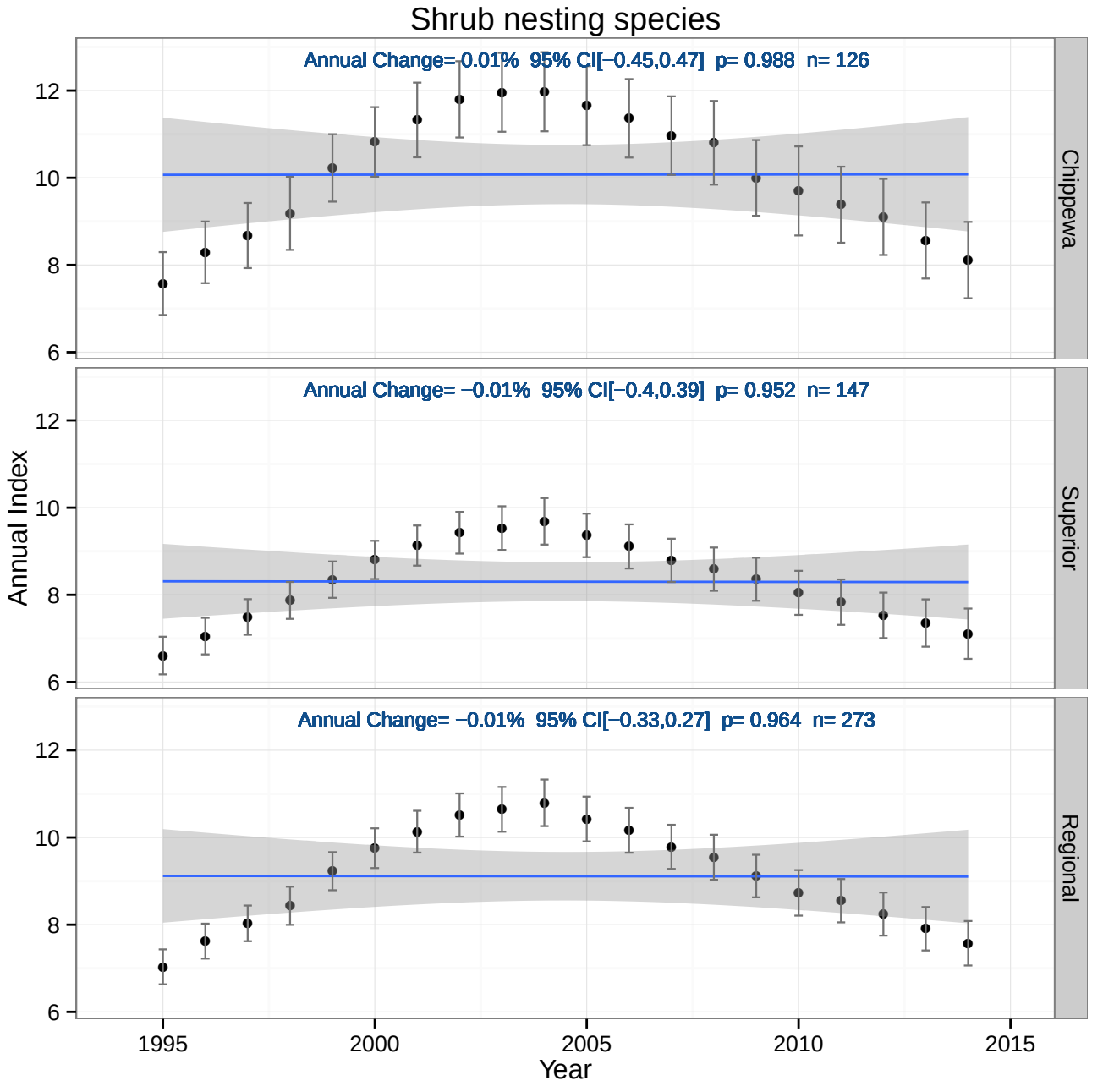

Nashville Warbler
Annual Change= 2.19% 95% CI[1.34,2.95] p= 0 n= 113
Annual Change= 1.65% 95% CI[1.24,2.02] p= 0 n= 147
Annual Change= 1.85% 95% CI[1.52,2.23] p= 0 n= 260
Chippewa
Superior
Regional
Annual Index
Year
1.5
2.0
2.5
3.0
1995
2000
2005
2010
2015

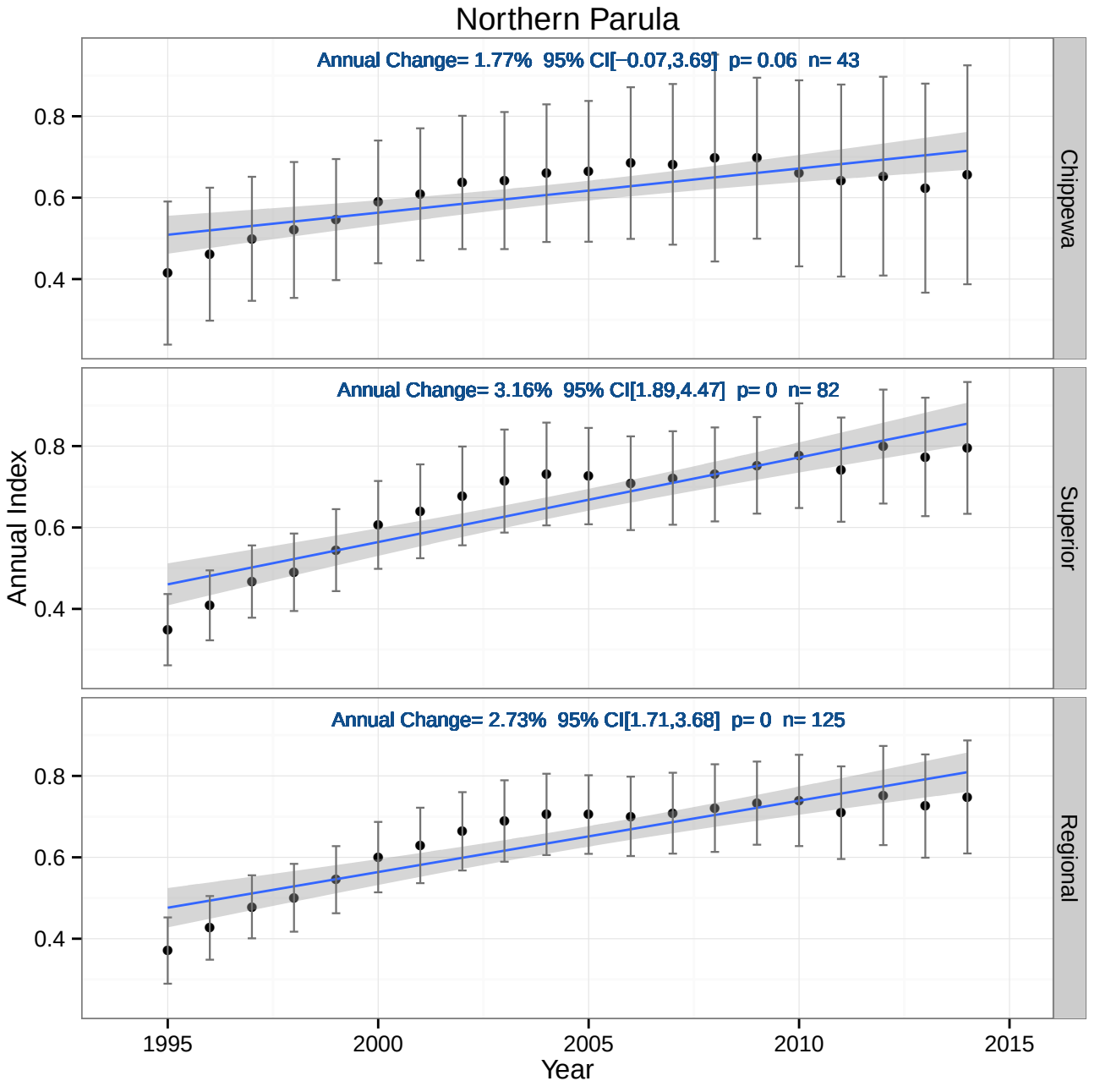

Canopy nesting species
Annual Change= 0.52% 95% CI[0.13,0.9] p= 0.012 n= 126
Chippewa
Annual Change= 2.01% 95% CI[1.55,2.45] p= 0 n= 147
Superior
Annual Change= 1.26% 95% CI[0.99,1.54] p= 0 n= 273
Regional
Annual Index
Year
7
6
5
4
1995
2000
2005
2010
2015

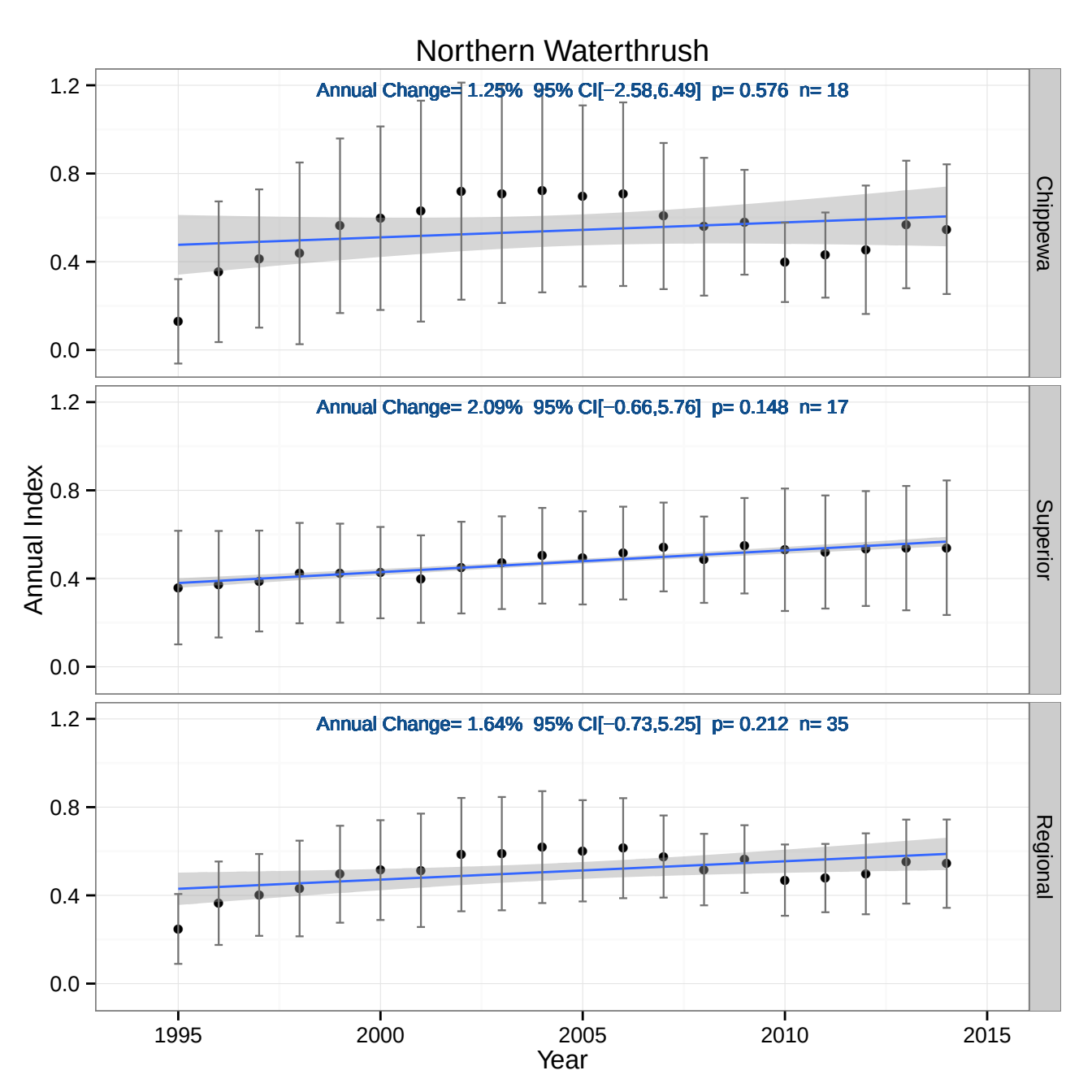

Cavity nesting species
Annual Change= 1.84% 95% CI[1.27,2.35] p= 0 n= 126
Annual Change= 1.76% 95% CI[1.19,2.3] p= 0 n= 147
Annual Change= 1.8% 95% CI[1.46,2.2] p= 0 n= 273
Chippewa
Superior
Regional
Annual Index
Year
3.0
2.5
2.0
1.5
1.0
1995
2000
2005
2010
2015

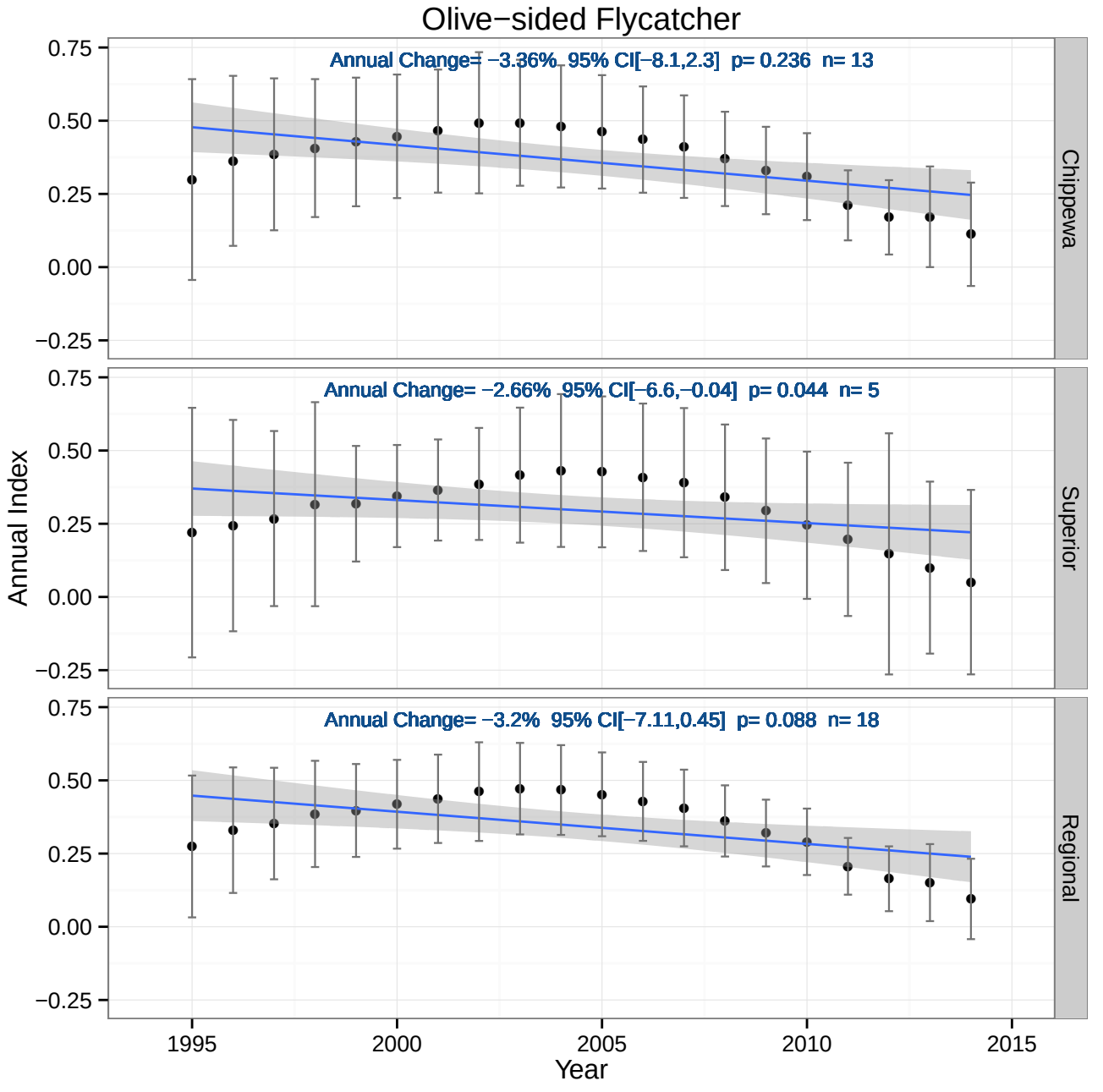

Ground nesting species
Annual Change= 1.06% 95% CI[0.77,1.36] p= 0 n= 126
Chippewa
Annual Change= 0.4% 95% CI[0.17,0.61] p= 0 n= 147
Superior
Annual Change= 0.67% 95% CI[0.49,0.84] p= 0 n= 273
Regional
Annual Index
Year
9
11
13
15
17
1995
2000
2005
2010
2015

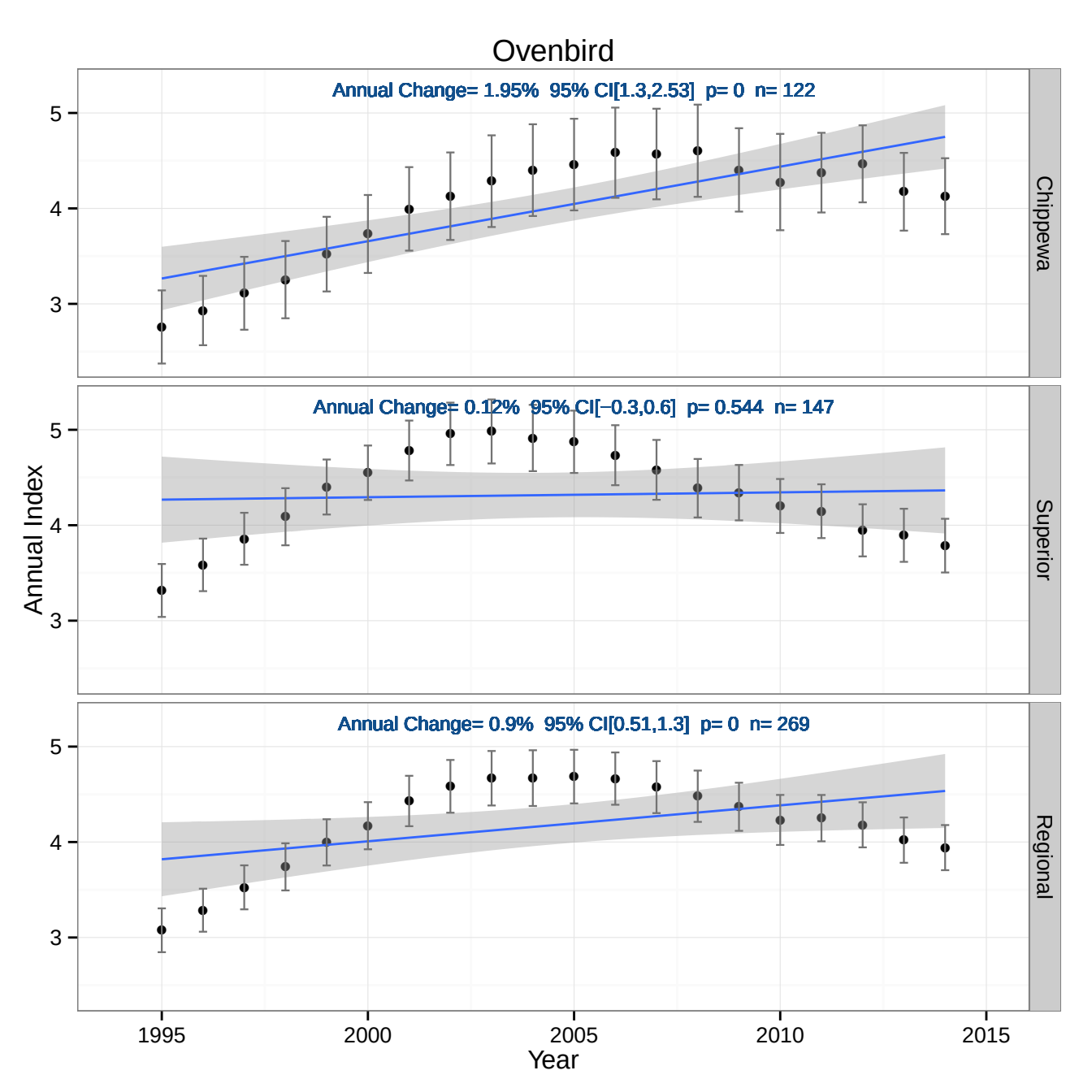

Nest parasites
Annual Change= −3.53% 95% CI[−8.07,0.89] p= 0.14 n= 15
Annual Index
0.0
0.2
0.4
0.6
1995
2000
2005
2010
2015
Year
Chippewa

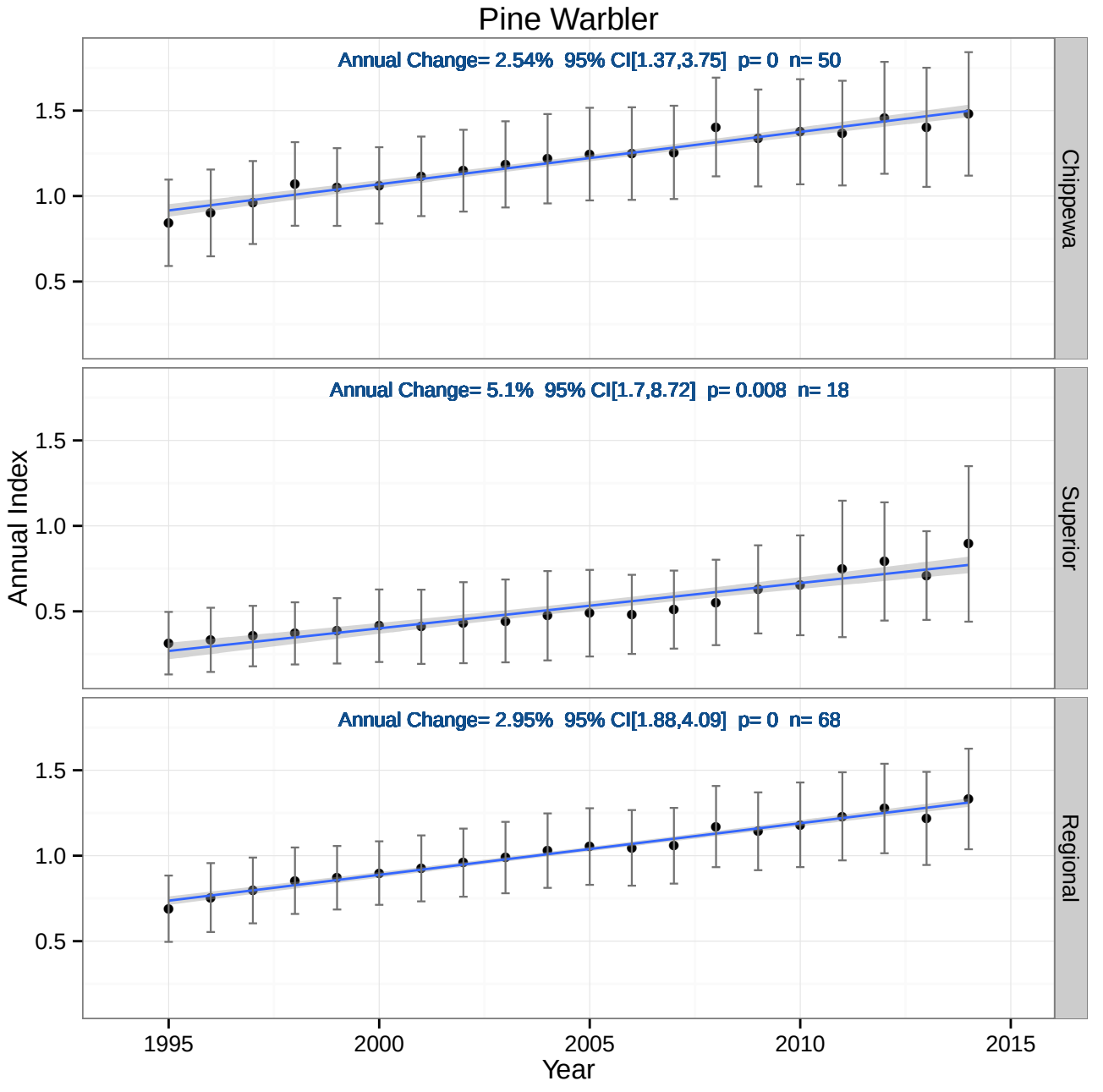

Shrub nesting species
Annual Change= 0.01% 95% CI[−0.45,0.47] p= 0.988 n= 126
Annual Change= −0.01% 95% CI[−0.4,0.39] p= 0.952 n= 147
Annual Change= −0.01% 95% CI[−0.33,0.27] p= 0.964 n= 273
Chippewa
Superior
Regional
Annual Index
Year
6
8
10
12
1995
2000
2005
2010
2015

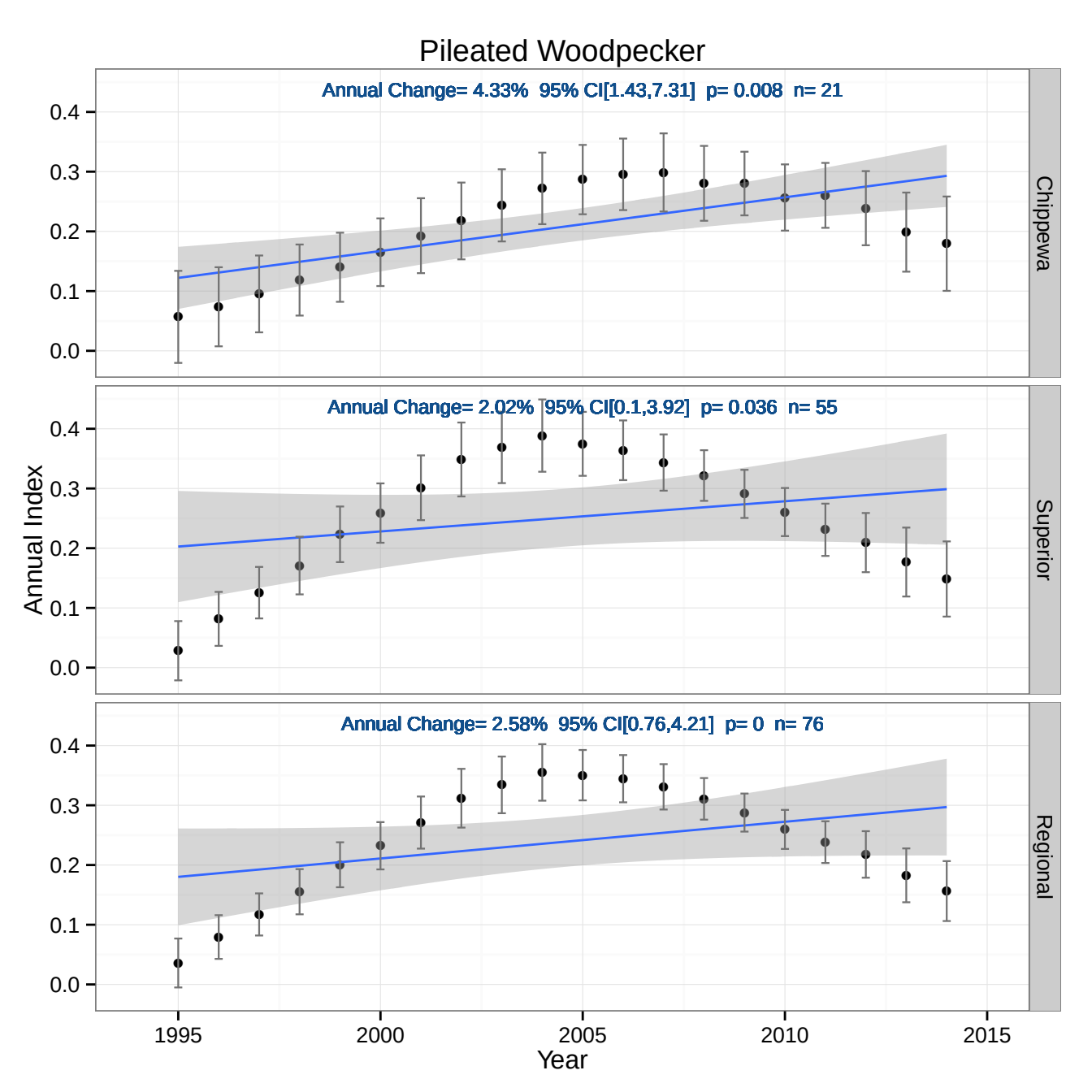

Northern Parula
Annual Change= 1.77% 95% CI[−0.07,3.69] p= 0.06 n= 43
Annual Change= 3.16% 95% CI[1.89,4.47] p= 0 n= 82
Annual Change= 2.73% 95% CI[1.71,3.68] p= 0 n= 125
Chippewa
Superior
Regional
Annual Index
0.4
0.6
0.8
1995
2000
2005
2010
2015
Year

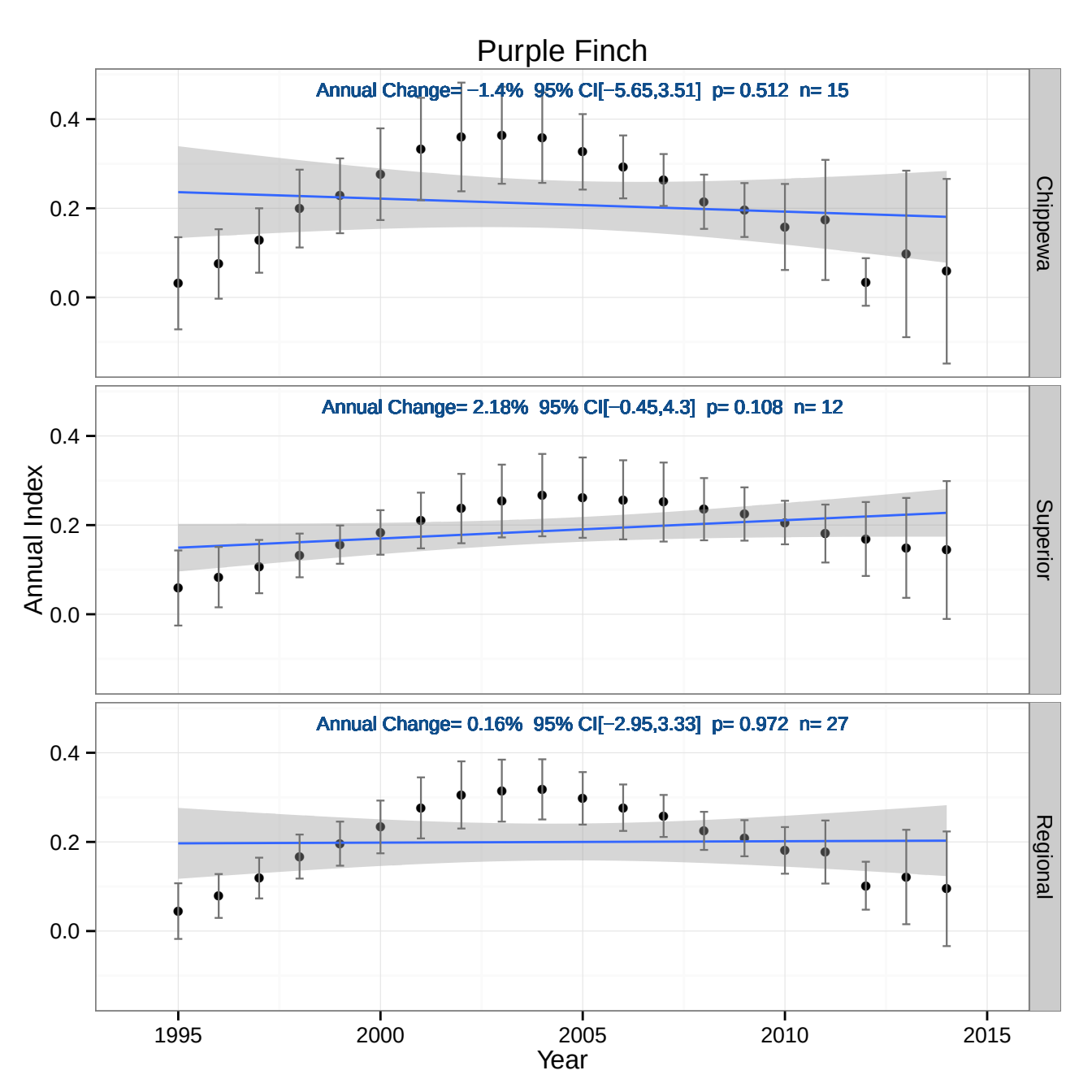

Northern Waterthrush
Annual Change= 1.25% 95% CI[−2.58,6.49] p= 0.576 n= 18
Annual Change= 2.09% 95% CI[−0.66,5.76] p= 0.148 n= 17
Annual Change= 1.64% 95% CI[−0.73,5.25] p= 0.212 n= 35
Chippewa
Superior
Regional
Annual Index
Year
1.2
0.8
0.4
0.0
1995
2000
2005
2010
2015

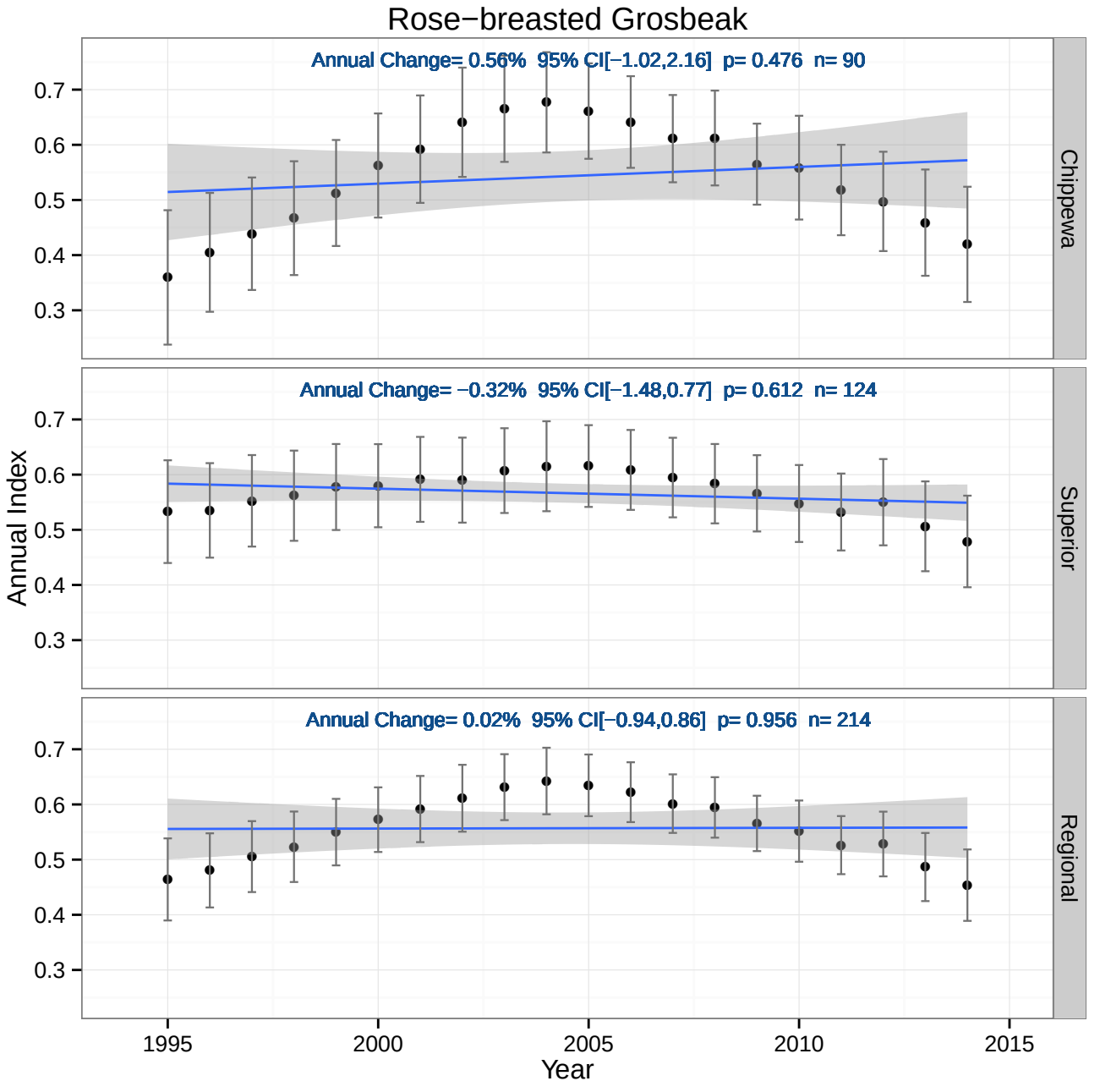

Olive−sided Flycatcher
Annual Change= −3.36% 95% CI[−8.1,2.3] p= 0.236 n= 13
Annual Change= −2.66% 95% CI[−6.6,−0.04] p= 0.044 n= 5
Annual Change= −3.2% 95% CI[−7.11,0.45] p= 0.088 n= 18
Chippewa
Superior
Regional
Annual Index
Year
0.75
0.50
0.25
0.00
−0.25
1995
2000
2005
2010
2015

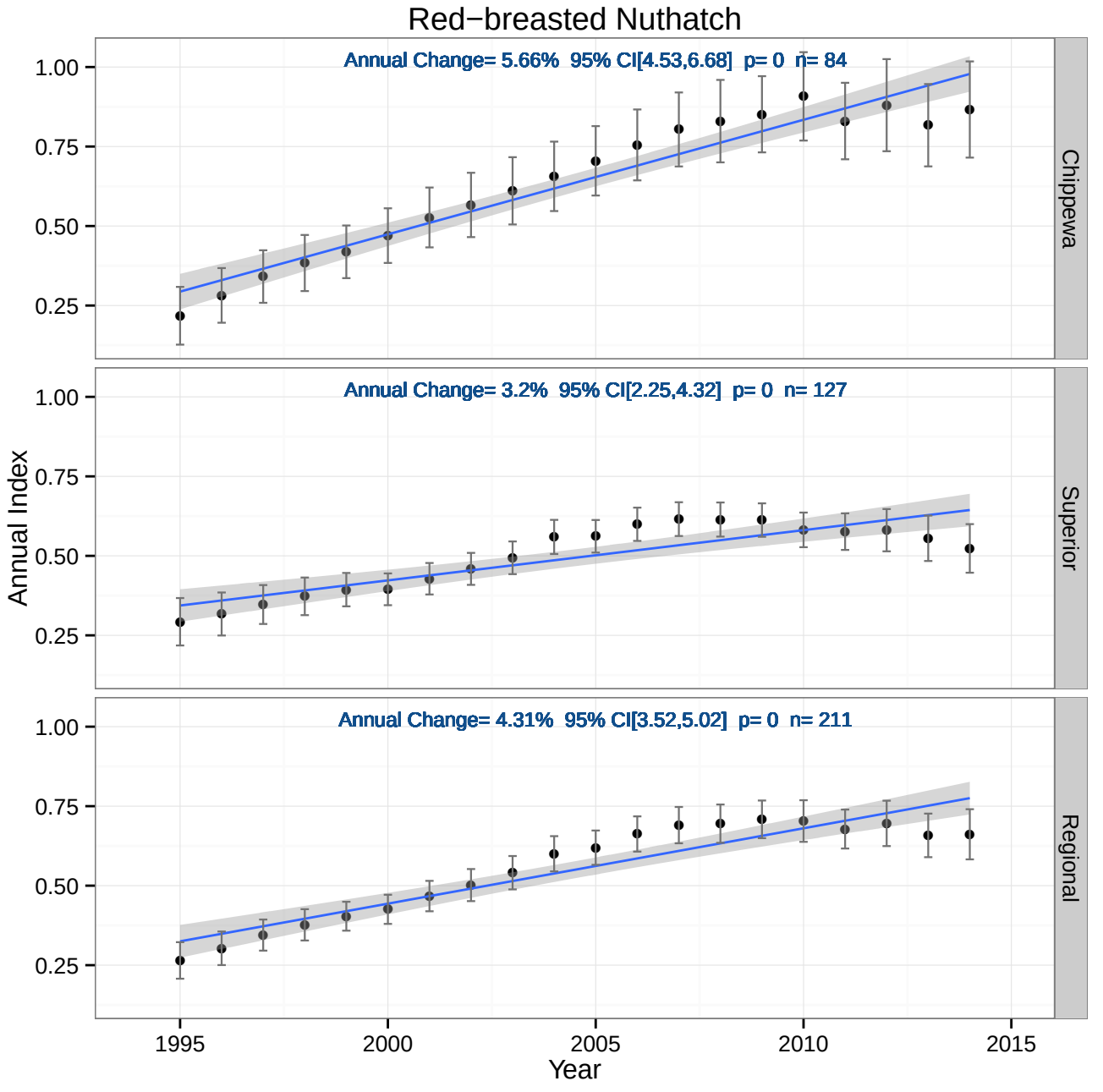

Ovenbird
Annual Change= 1.95% 95% CI[1.3,2.53] p= 0 n= 122
Annual Change= 0.12% 95% CI[−0.3,0.6] p= 0.544 n= 147
Annual Change= 0.9% 95% CI[0.51,1.3] p= 0 n= 269
Chippewa
Superior
Regional
Annual Index
Year
1995
2000
2005
2010
2015
3
4
5

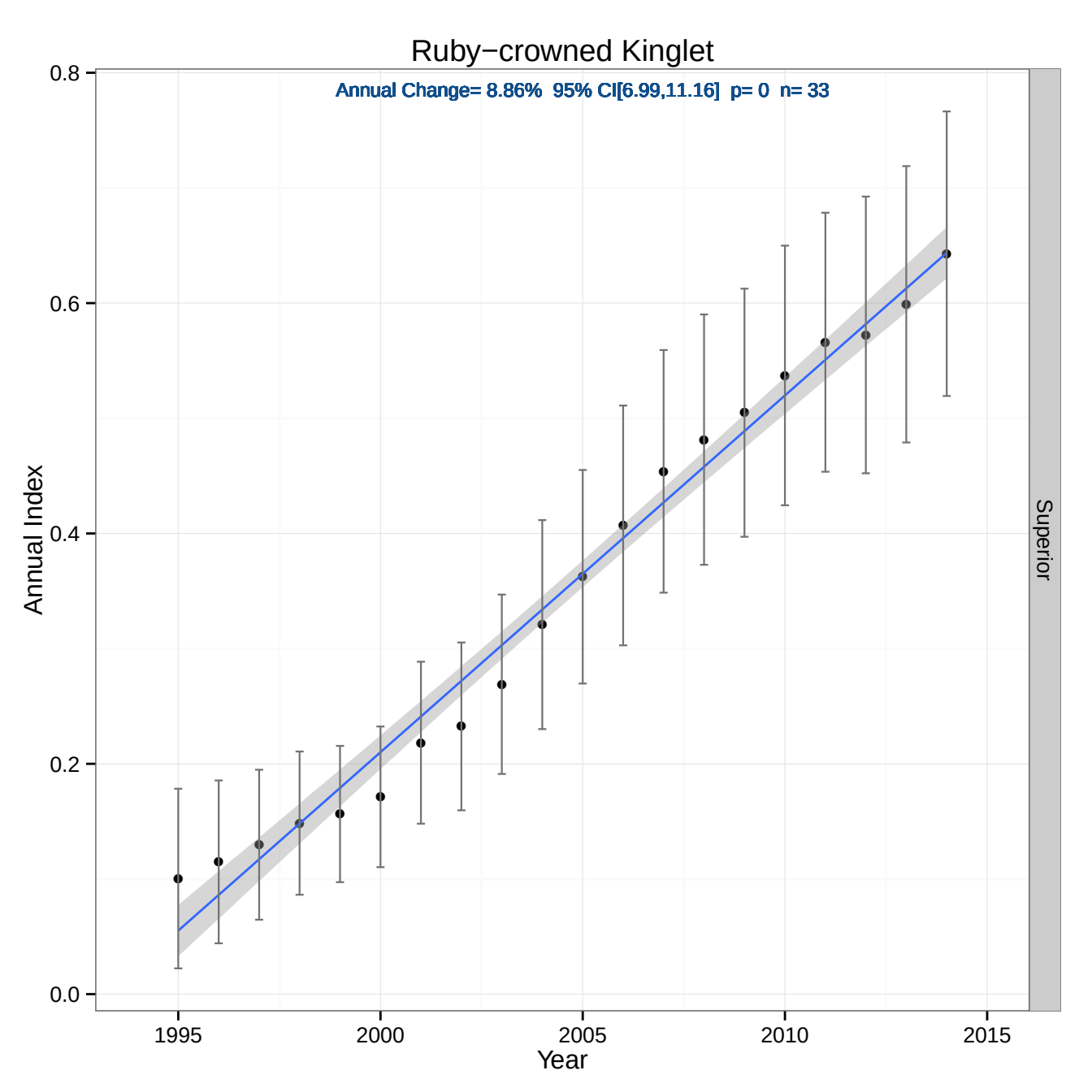

Pine Warbler
Annual Change= 2.54% 95% CI[1.37,3.75] p= 0 n= 50
Annual Change= 5.1% 95% CI[1.7,8.72] p= 0.008 n= 18
Annual Change= 2.95% 95% CI[1.88,4.09] p= 0 n= 68
Chippewa
Superior
Regional
Annual Index
0.5
1.0
1.5
1995
2000
2005
2010
2015
Year

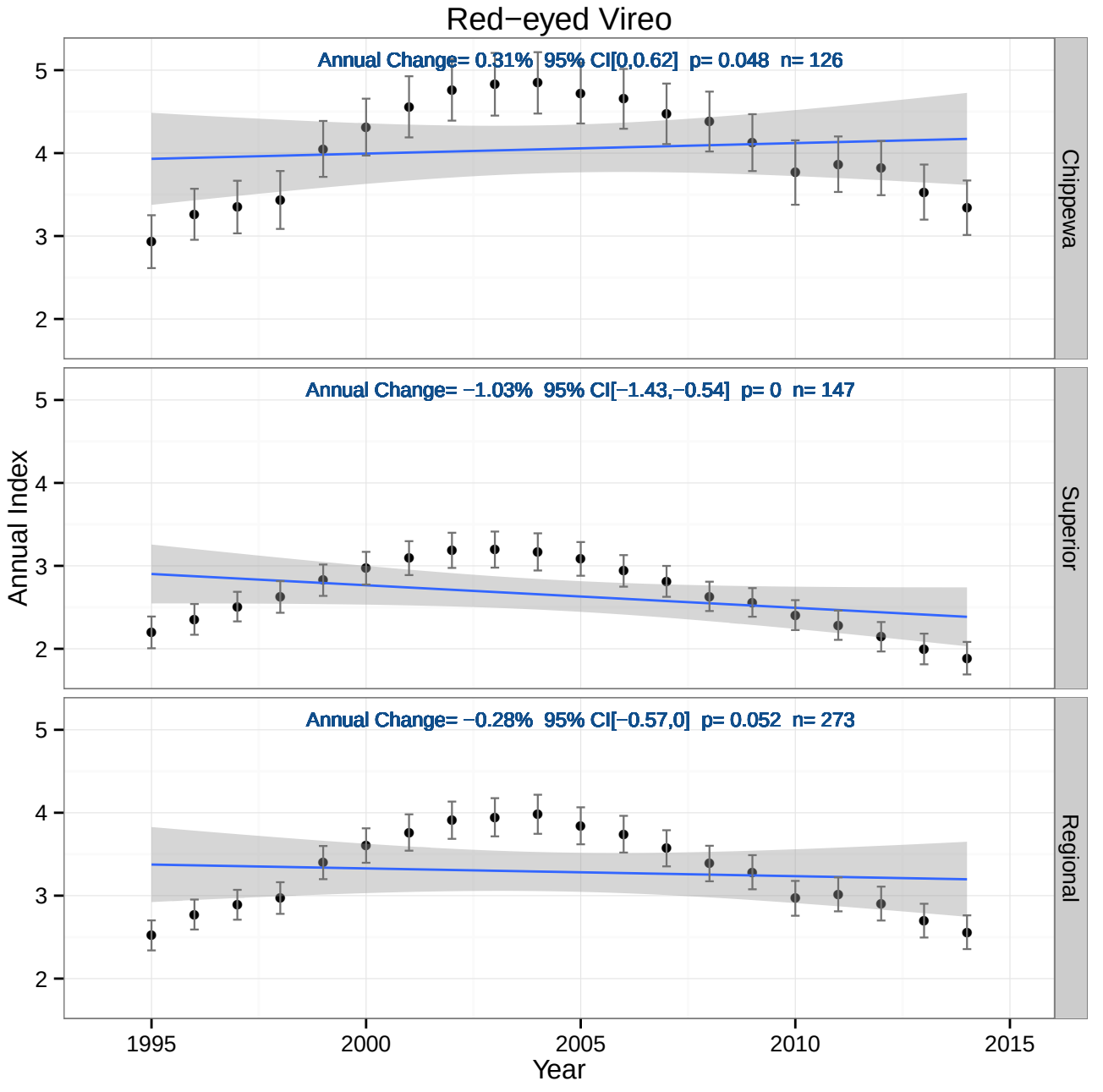

Pileated Woodpecker
Annual Change= 4.33% 95% CI[1.43,7.31] p= 0.008 n= 21
Annual Change= 2.02% 95% CI[0.1,3.92] p= 0.036 n= 55
Annual Change= 2.58% 95% CI[0.76,4.21] p= 0 n= 76
Chippewa
Superior
Regional
Annual Index
Year
0.0
0.1
0.2
0.3
0.4
1995
2000
2005
2010
2015

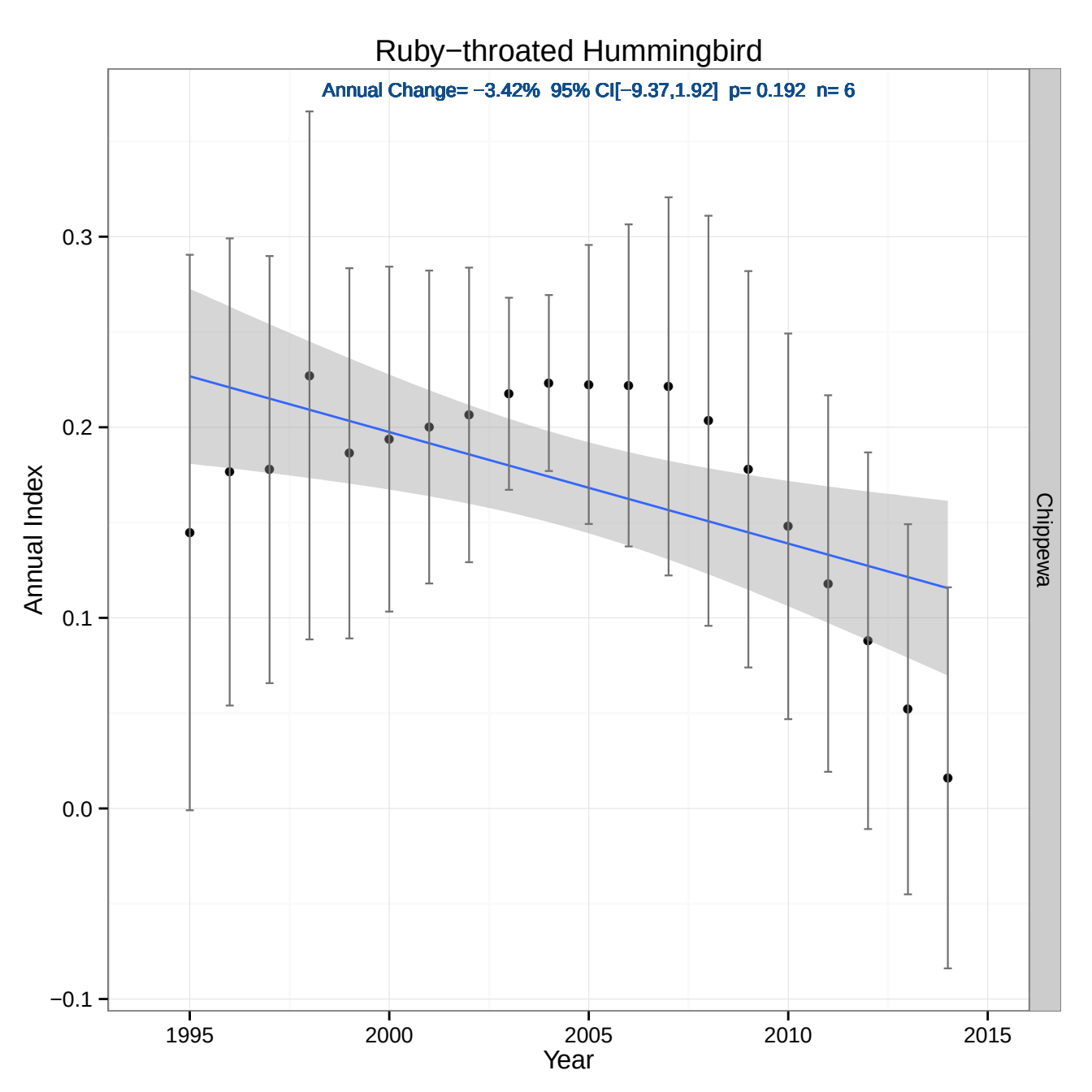

Purple Finch
Annual Change= −1.4% 95% CI[−5.65,3.51] p= 0.512 n= 15
Annual Change= 2.18% 95% CI[−0.45,4.3] p= 0.108 n= 12
Annual Change= 0.16% 95% CI[−2.95,3.33] p= 0.972 n= 27
Chippewa
Superior
Regional
Annual Index
0.0
0.2
0.4
1995
2000
2005
2010
2015
Year

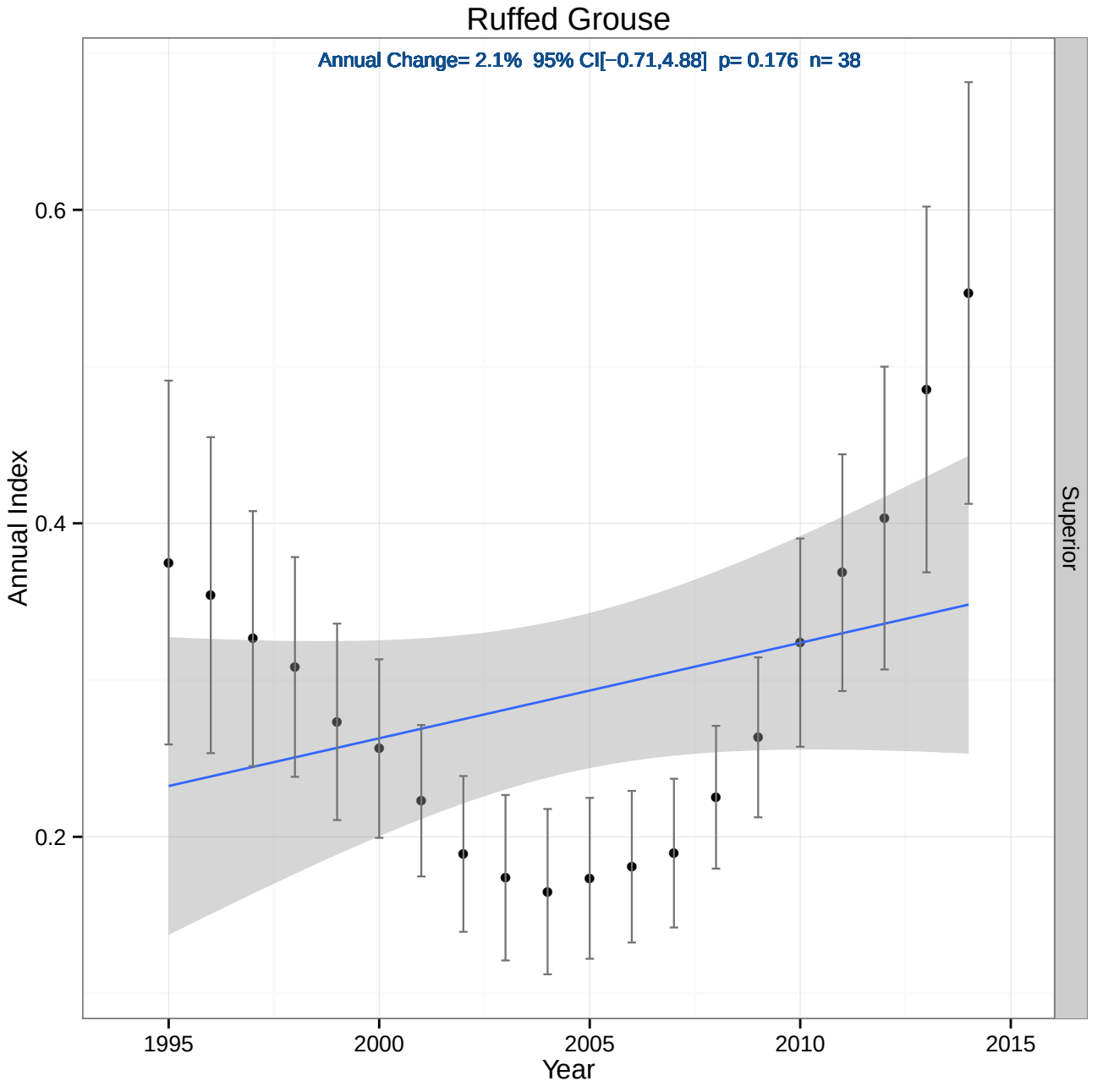

Rose−breasted Grosbeak
Annual Change= 0.56% 95% CI[−1.02,2.16] p= 0.476 n= 90
Annual Change= −0.32% 95% CI[−1.48,0.77] p= 0.612 n= 124
Annual Change= 0.02% 95% CI[−0.94,0.86] p= 0.956 n= 214
Chippewa
Superior
Regional
Annual Index
0.7
0.6
0.5
0.4
0.3
1995
2000
2005
2010
2015
Year

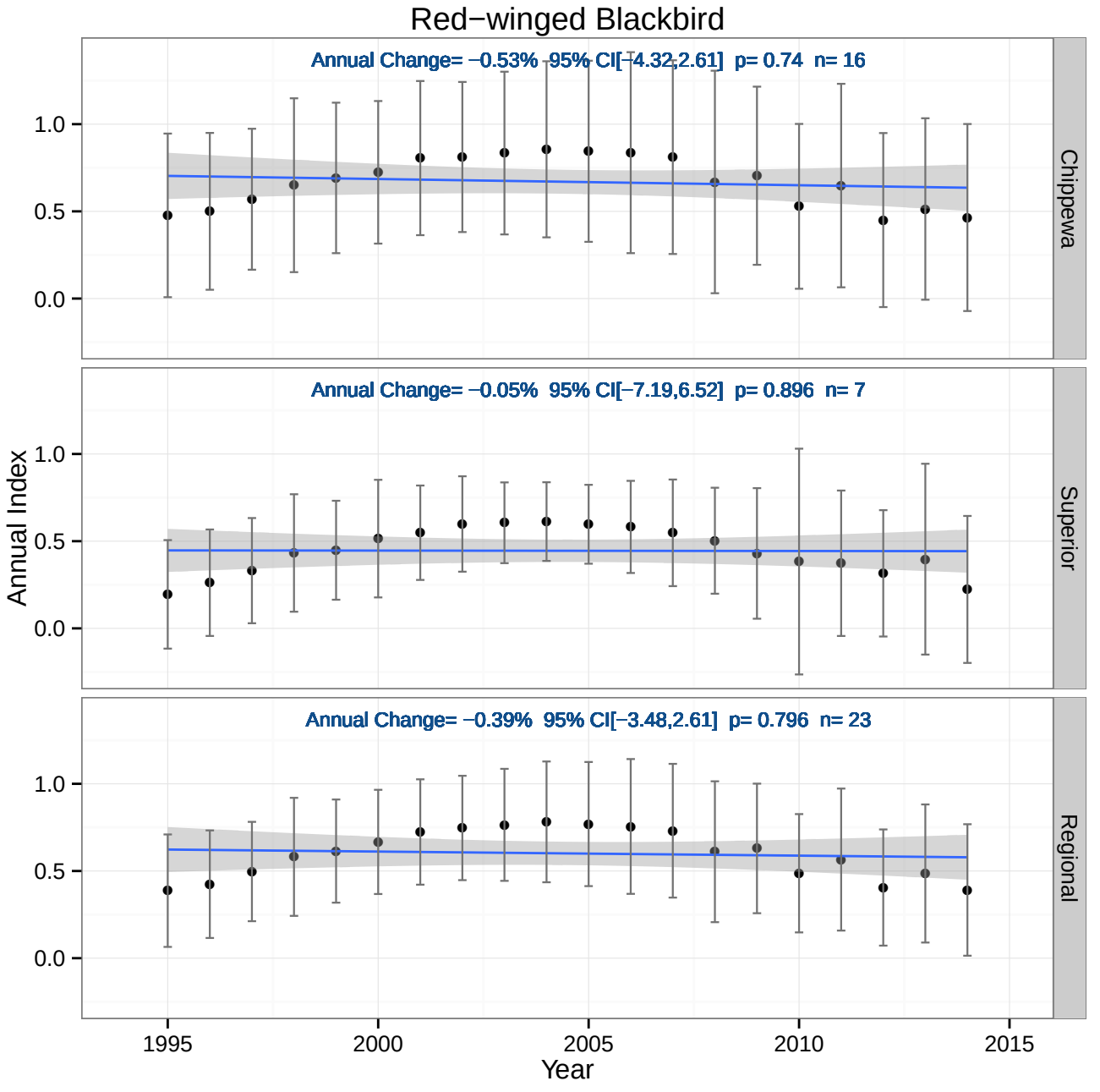

Red−breasted Nuthatch
Annual Change= 5.66% 95% CI[4.53,6.68] p= 0 n= 84
Annual Change= 3.2% 95% CI[2.25,4.32] p= 0 n= 127
Annual Change= 4.31% 95% CI[3.52,5.02] p= 0 n= 211
Chippewa
Superior
Regional
Annual Index
1.00
0.75
0.50
0.25
1995
2000
2005
2010
2015
Year

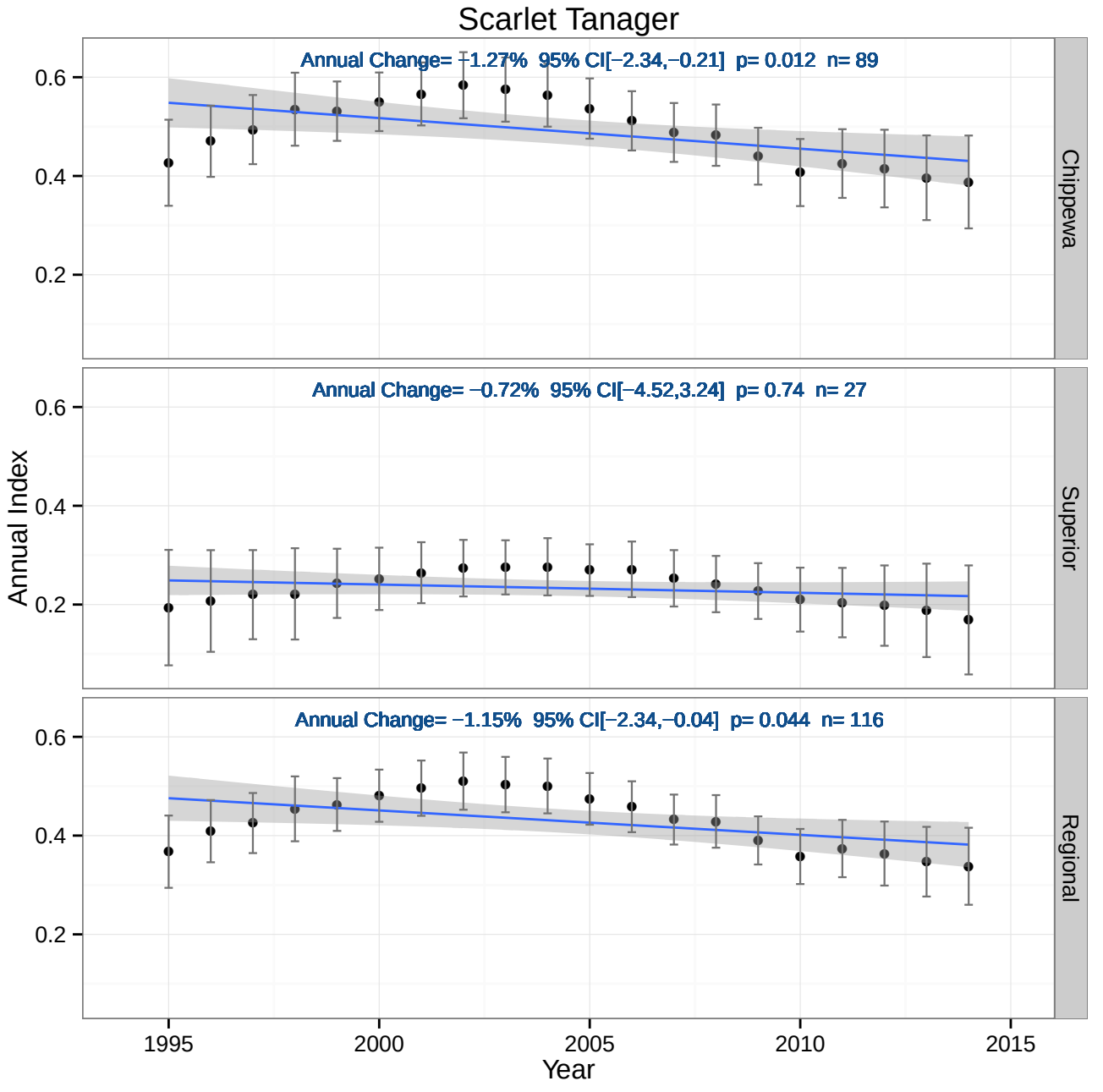

Ruby−crowned Kinglet
Annual Change= 8.86% 95% CI[6.99,11.16] p= 0 n= 33
Annual Index
0.0
0.2
0.4
0.6
0.8
1995
2000
2005
2010
2015
Year
Superior

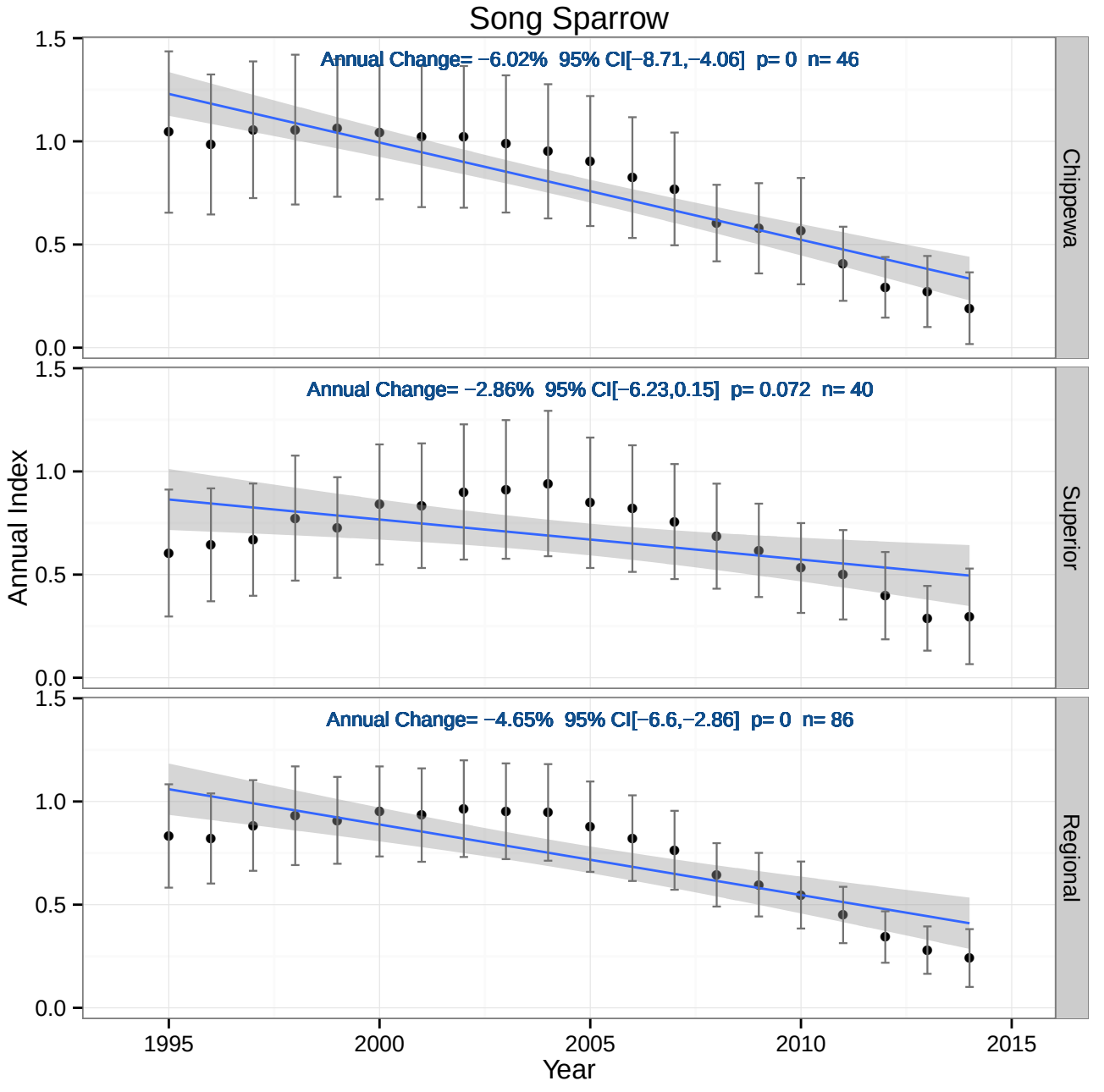

Red−eyed Vireo
Annual Change= 0.31% 95% CI[0,0.62] p= 0.048 n= 126
Annual Change= −1.03% 95% CI[−1.43,−0.54] p= 0 n= 147
Annual Change= −0.28% 95% CI[−0.57,0] p= 0.052 n= 273
Chippewa
Superior
Regional
Annual Index
Year
1995
2000
2005
2010
2015
2
3
4
5

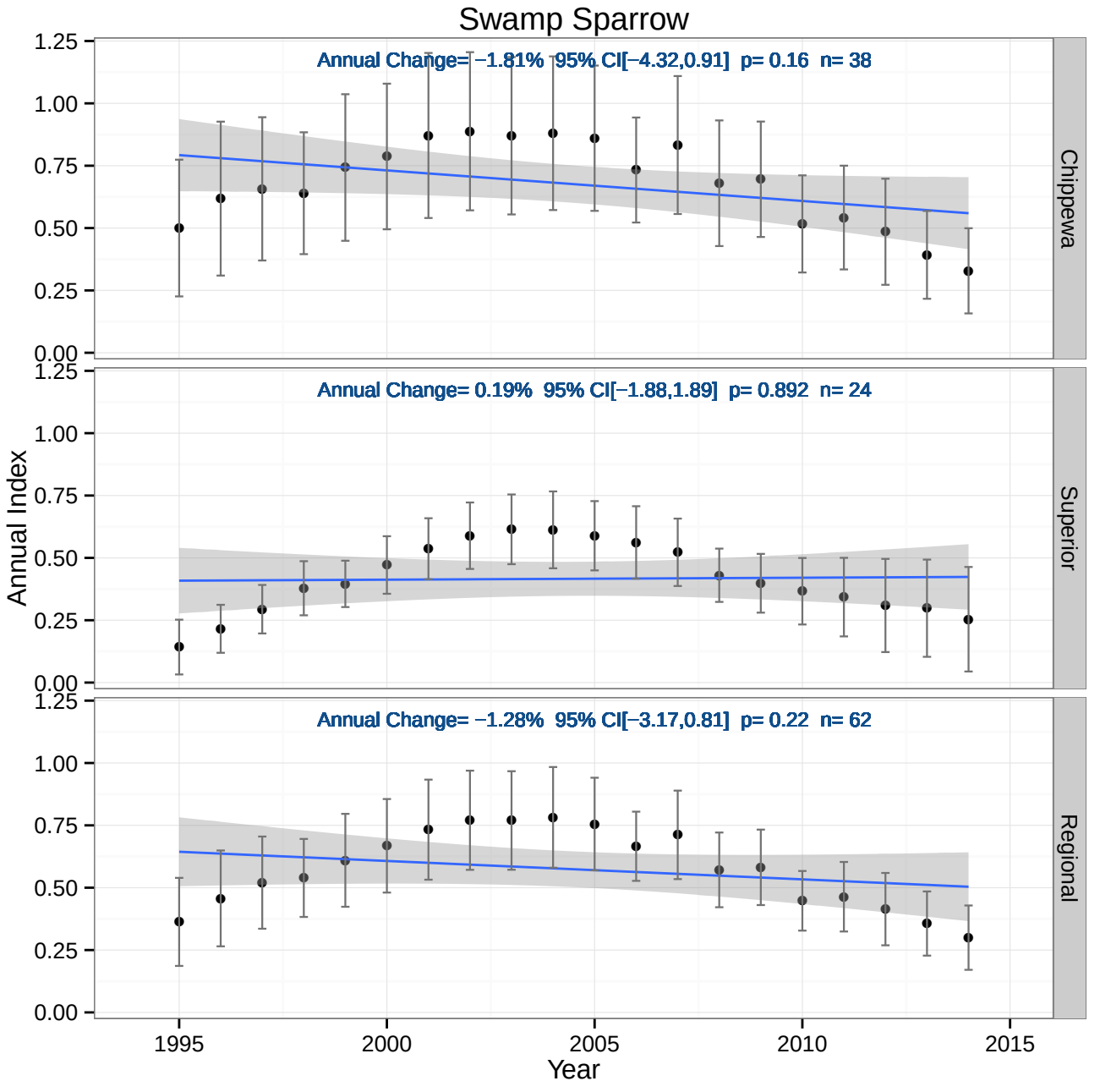

Ruby−throated Hummingbird
Annual Change= −3.42% 95% CI[−9.37,1.92] p= 0.192 n= 6
Annual Index
0.3
0.2
0.1
0.0
−0.1
1995
2000
2005
2010
2015
Year
Chippewa

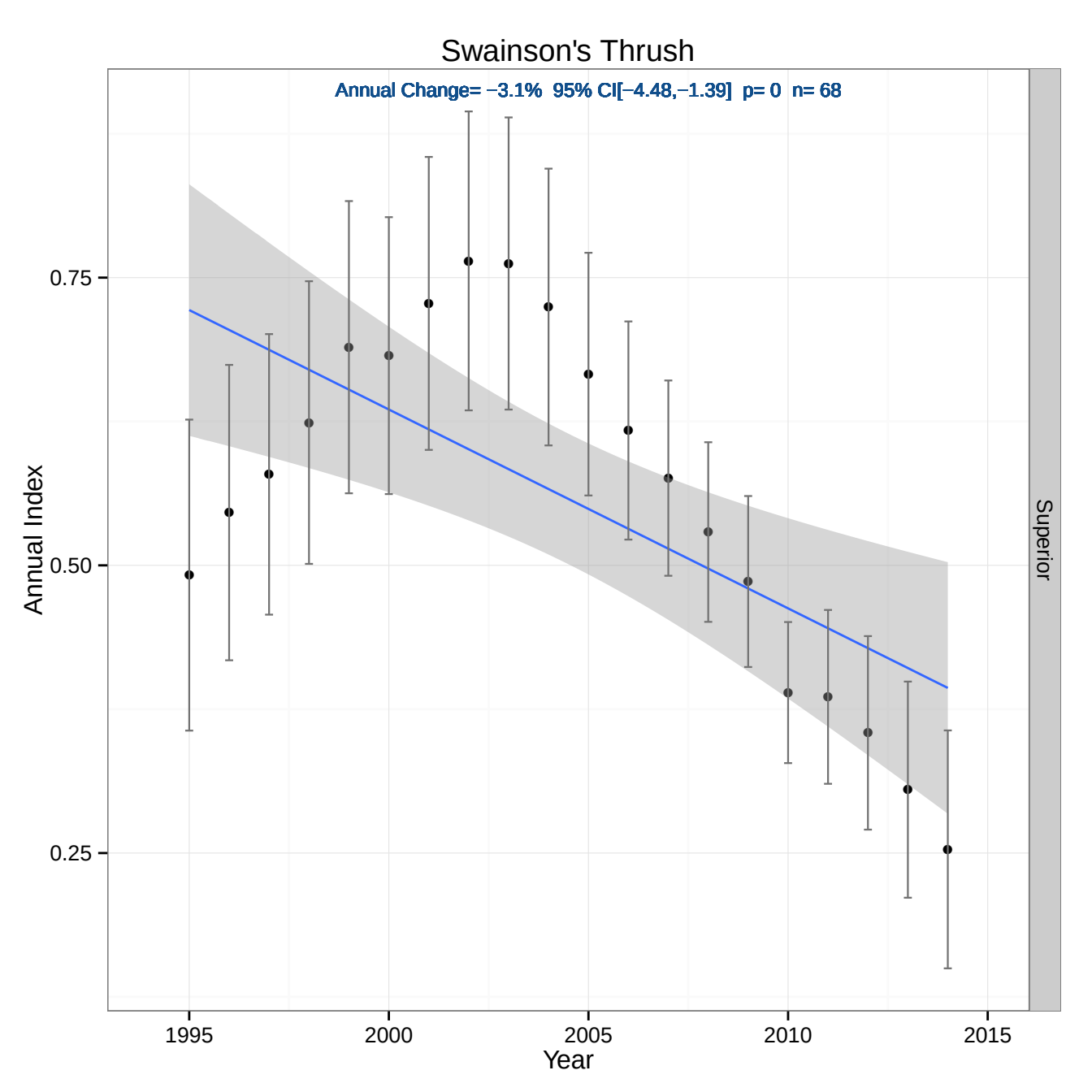

Ruffed Grouse
Annual Change= 2.1% 95% CI[−0.71,4.88] p= 0.176 n= 38
Annual Index
0.6
0.4
0.2
1995
2000
2005
2010
2015
Year
Superior

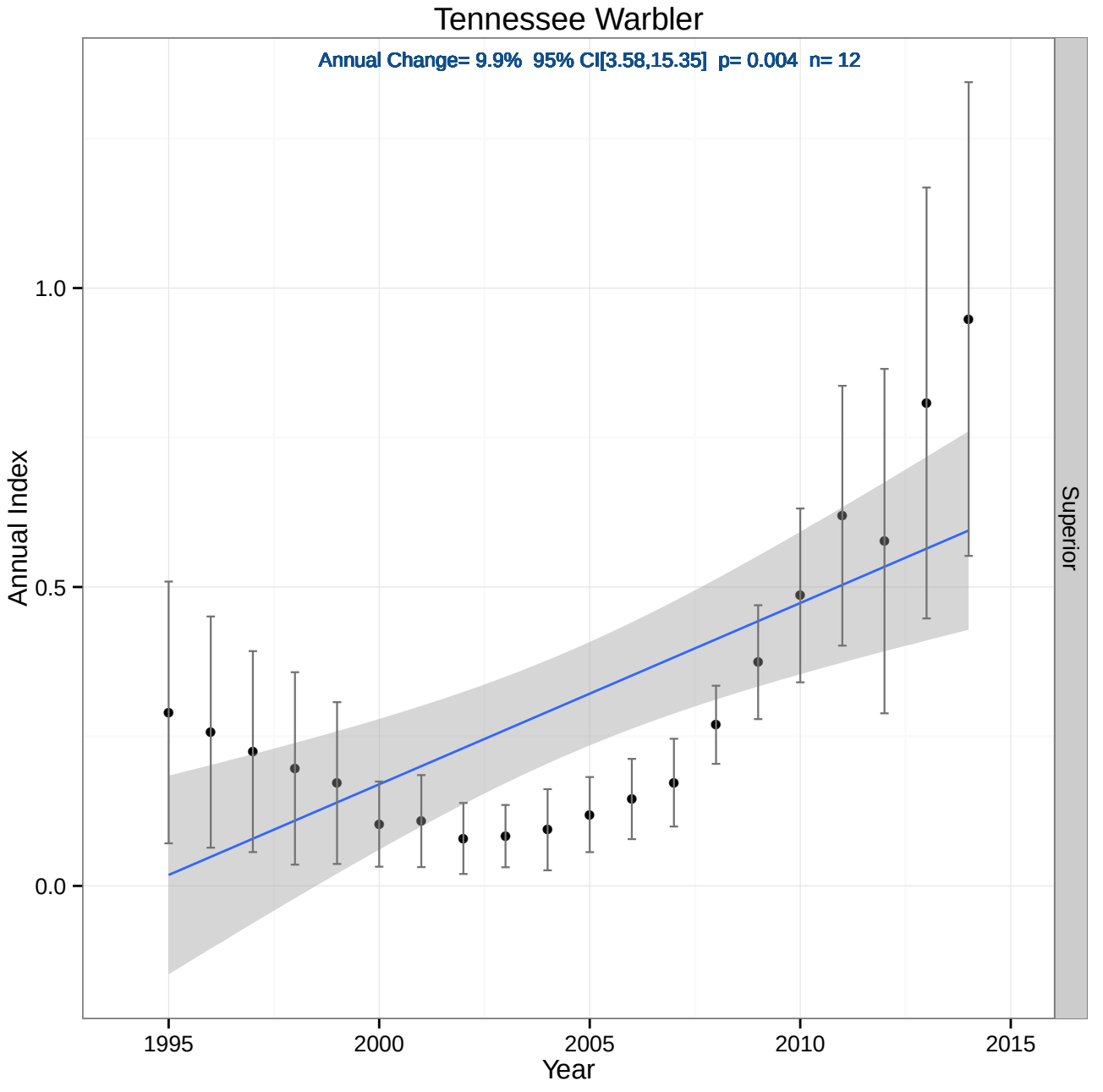

Red−winged Blackbird
Annual Change= −0.53% 95% CI[−4.32,2.61] p= 0.74 n= 16
Annual Change= −0.05% 95% CI[−7.19,6.52] p= 0.896 n= 7
Annual Change= −0.39% 95% CI[−3.48,2.61] p= 0.796 n= 23
Chippewa
Superior
Regional
Annual Index
Year
1.0
0.5
0.0
1995
2000
2005
2010
2015

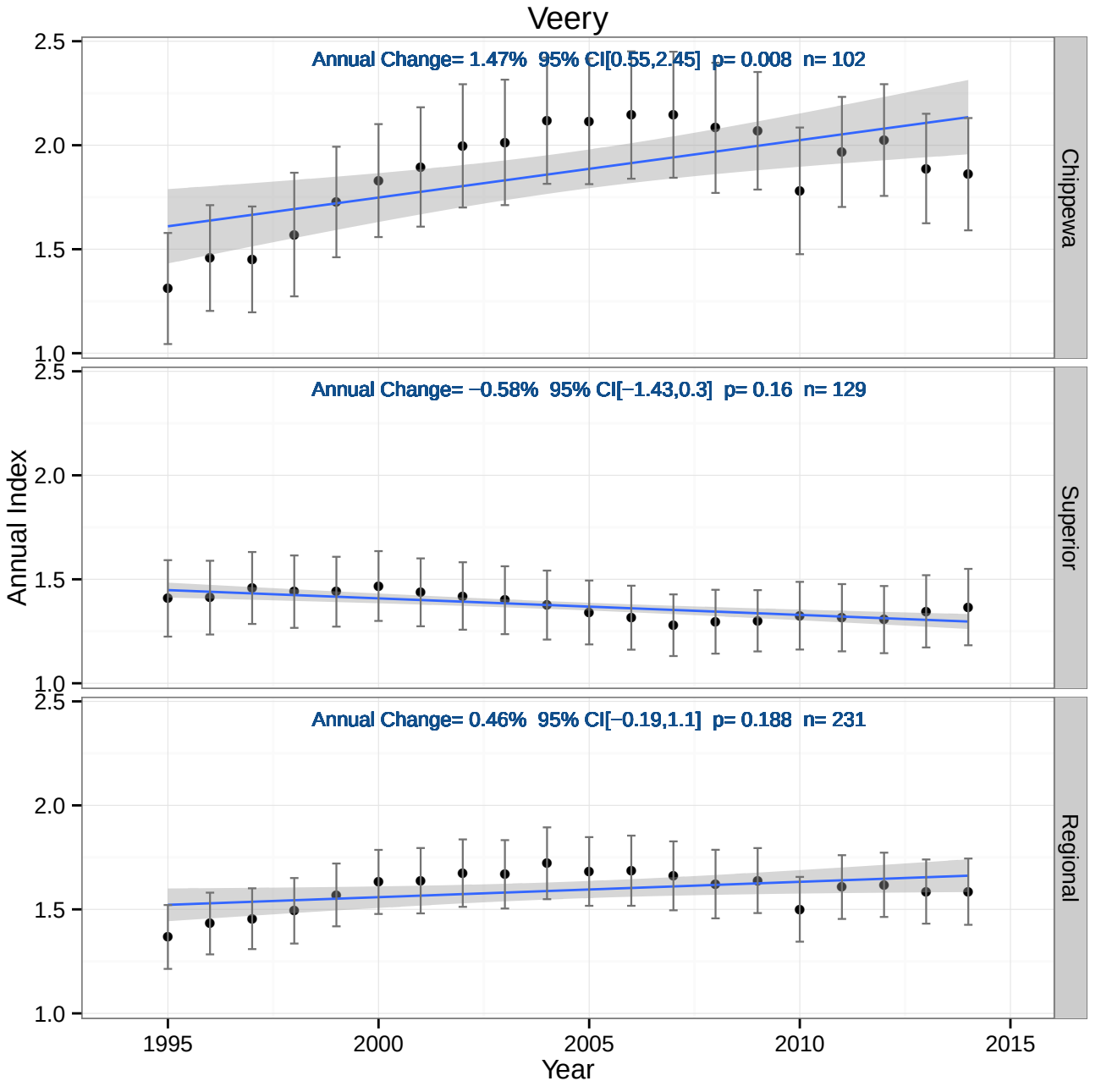

Scarlet Tanager
Annual Change= −1.27% 95% CI[−2.34,−0.21] p= 0.012 n= 89
Annual Change= −0.72% 95% CI[−4.52,3.24] p= 0.74 n= 27
Annual Change= −1.15% 95% CI[−2.34,−0.04] p= 0.044 n= 116
Chippewa
Superior
Regional
Annual Index
0.6
0.4
0.2
1995
2000
2005
2010
2015
Year

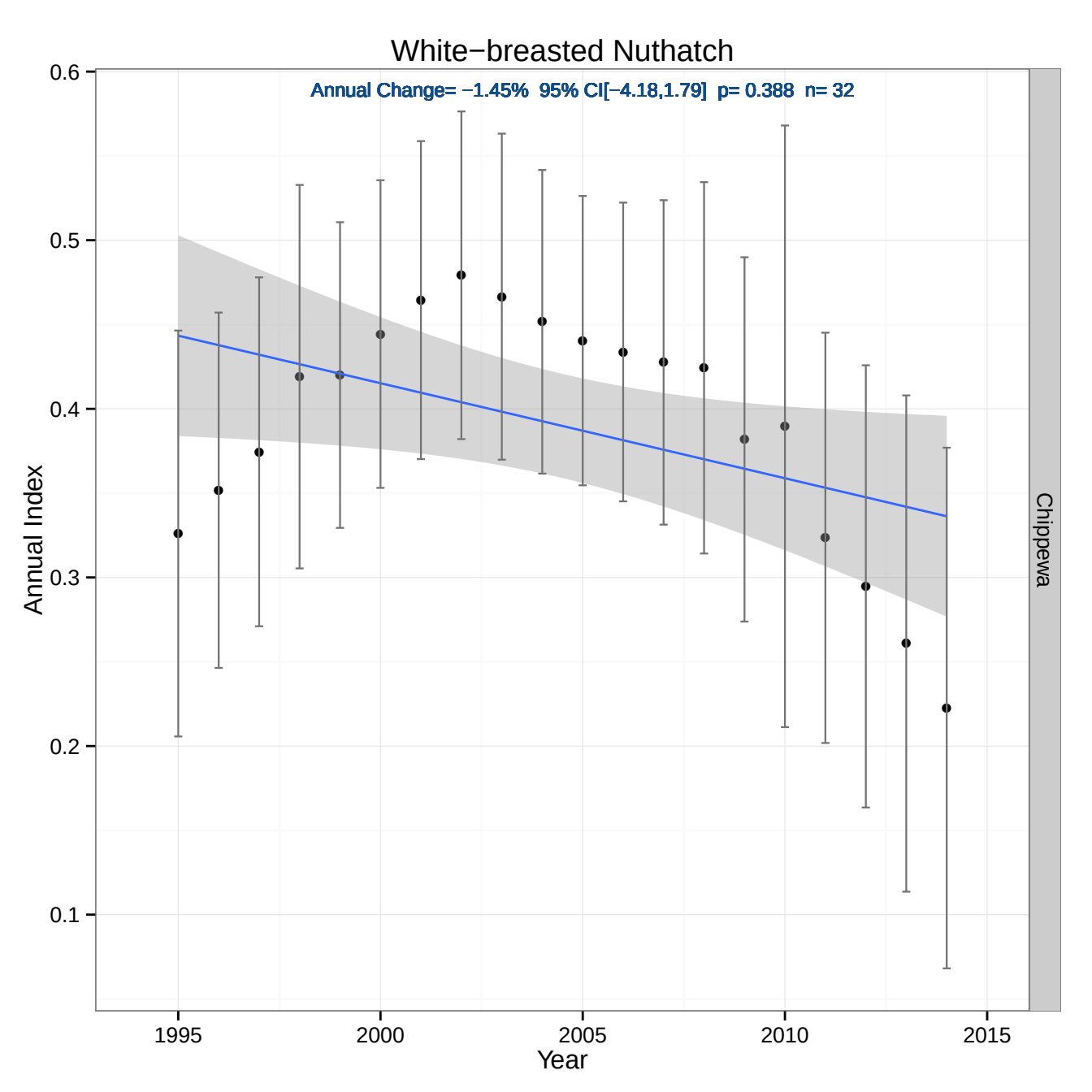

Song Sparrow
Annual Change= −6.02% 95% CI[−8.71,−4.06] p= 0 n= 46
Annual Change= −2.86% 95% CI[−6.23,0.15] p= 0.072 n= 40
Annual Change= −4.65% 95% CI[−6.6,−2.86] p= 0 n= 86
Chippewa
Superior
Regional
Annual Index
Year
1.5
1.0
0.5
0.0
1995
2000
2005
2010
2015

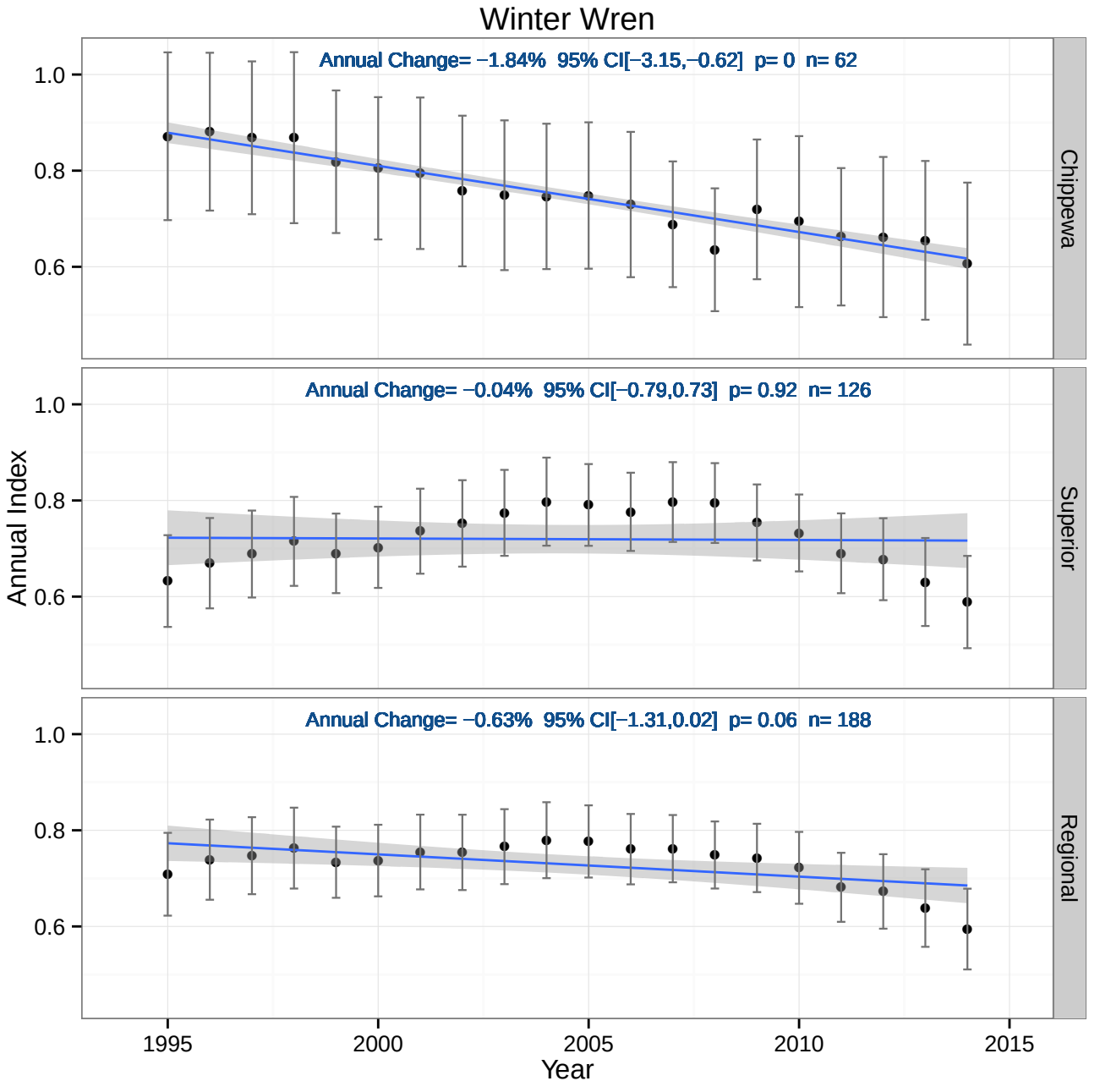

Swamp Sparrow
Annual Change= −1.81% 95% CI[−4.32,0.91] p= 0.16 n= 38
Annual Change= 0.19% 95% CI[−1.88,1.89] p= 0.892 n= 24
Annual Change= −1.28% 95% CI[−3.17,0.81] p= 0.22 n= 62
Chippewa
Superior
Regional
Annual Index
Year
1.25
1.00
0.75
0.50
0.25
0.00
1995
2000
2005
2010
2015

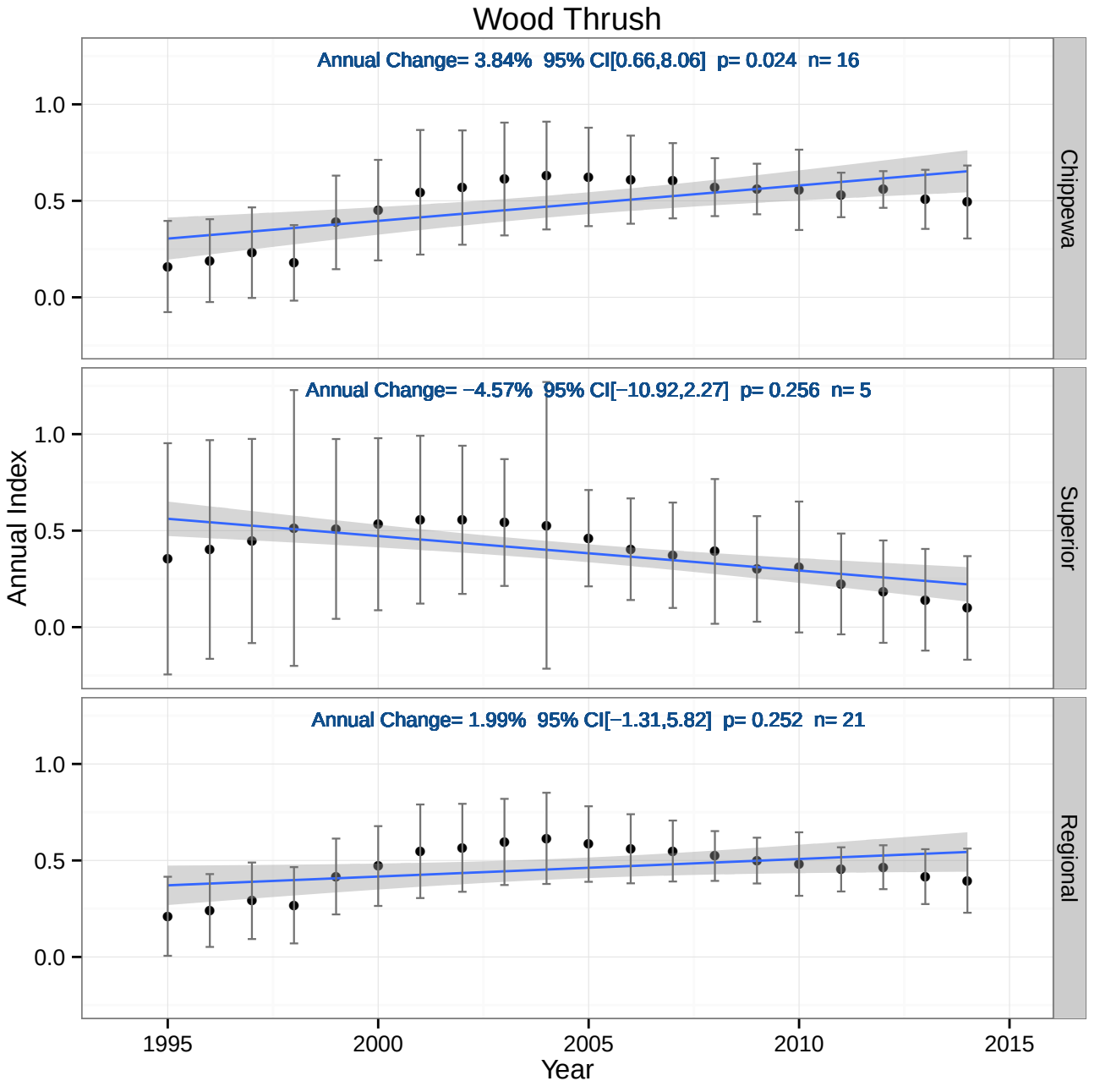

Swainson's Thrush
Annual Change= −3.1% 95% CI[−4.48,−1.39] p= 0 n= 68
Annual Index
0.75
0.50
0.25
1995
2000
2005
2010
2015
Year
Superior

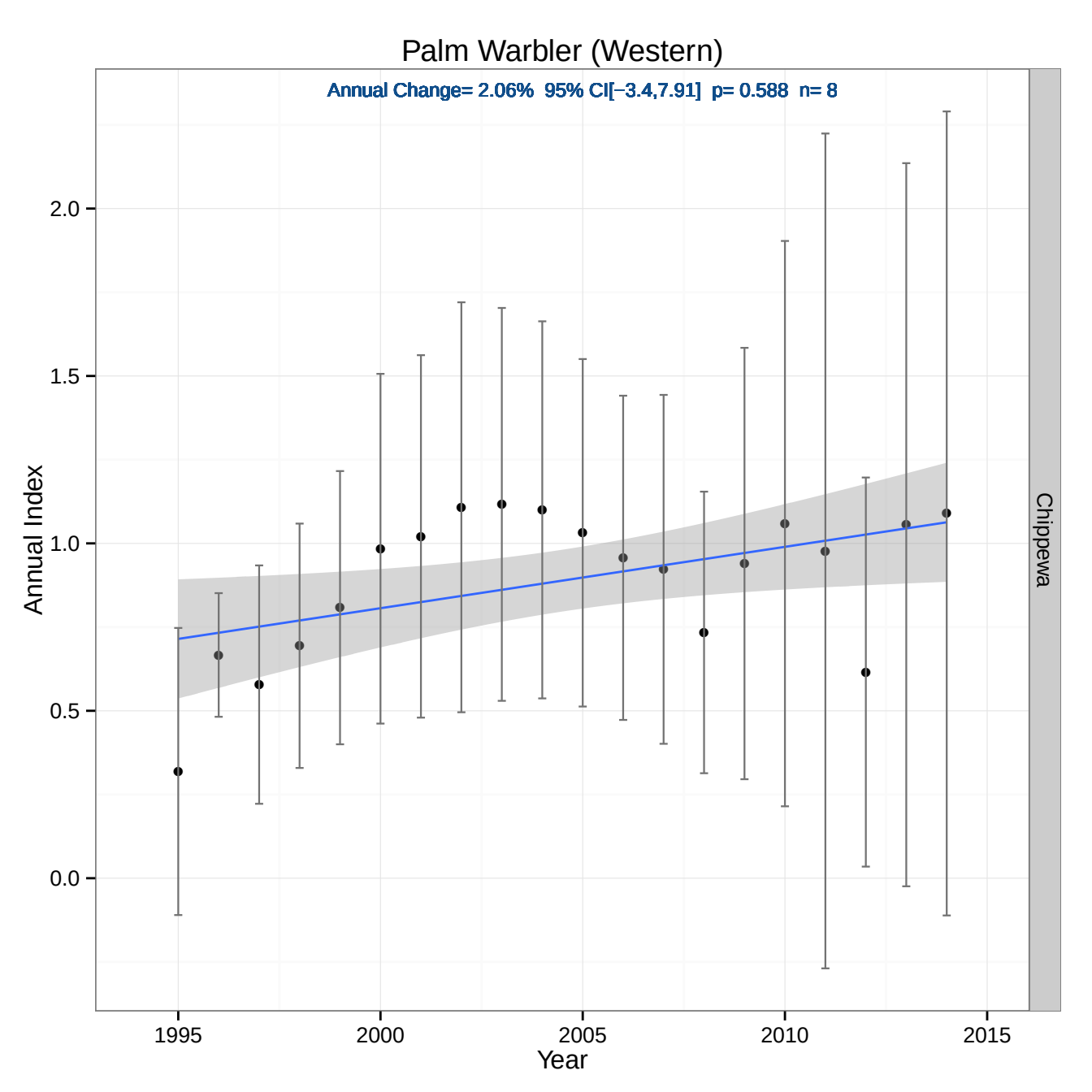

Tennessee Warbler
Annual Change= 9.9% 95% CI[3.58,15.35] p= 0.004 n= 12
Annual Index
1.0
0.5
0.0
1995
2000
2005
2010
2015
Year
Superior

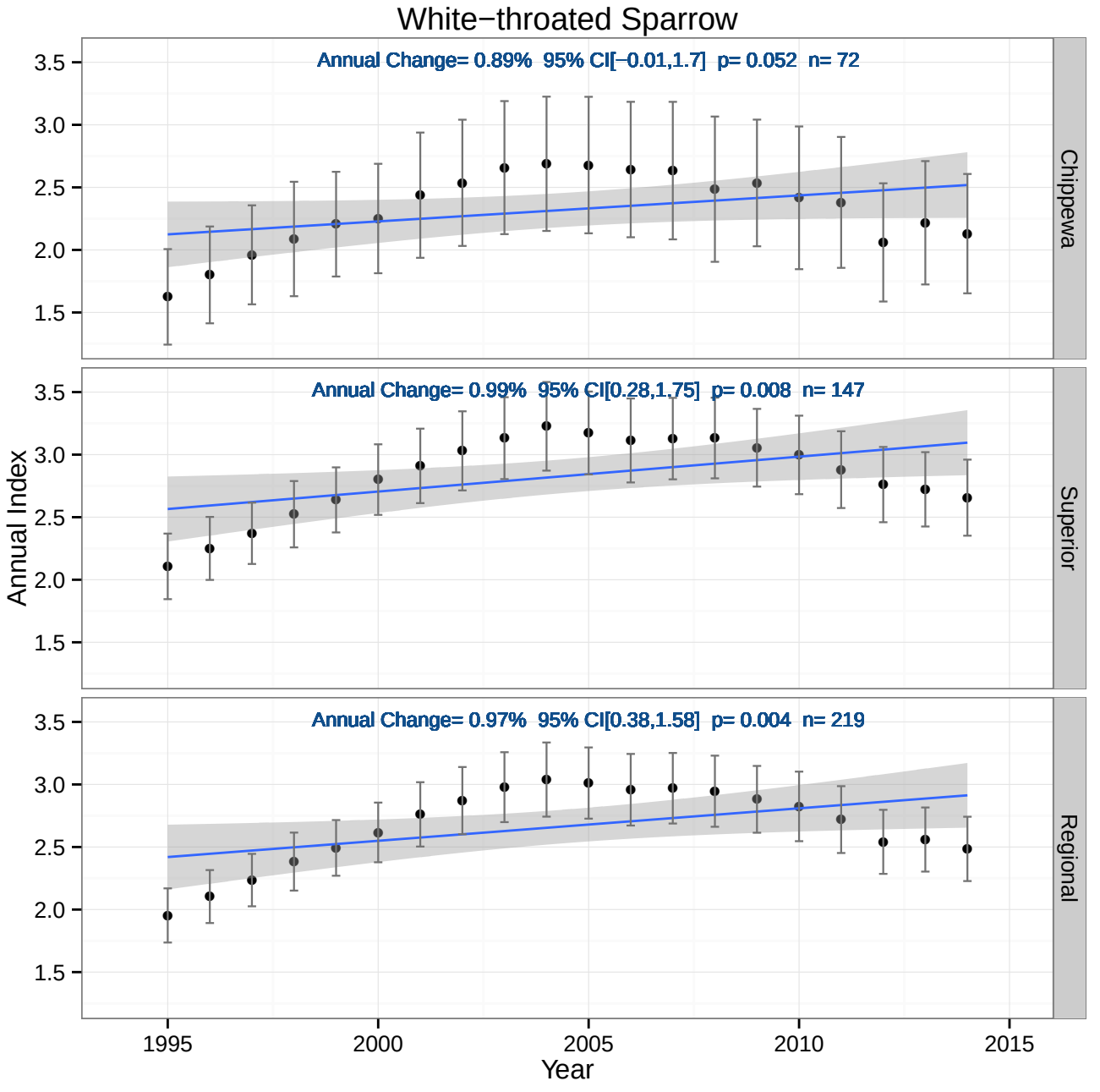

Veery
Annual Change= 1.47% 95% CI[0.55,2.45] p= 0.008 n= 102
Annual Change= −0.58% 95% CI[−1.43,0.3] p= 0.16 n= 129
Annual Change= 0.46% 95% CI[−0.19,1.1] p= 0.188 n= 231
Chippewa
Superior
Regional
Annual Index
Year
2.5
2.0
1.5
1.0
1995
2000
2005
2010
2015

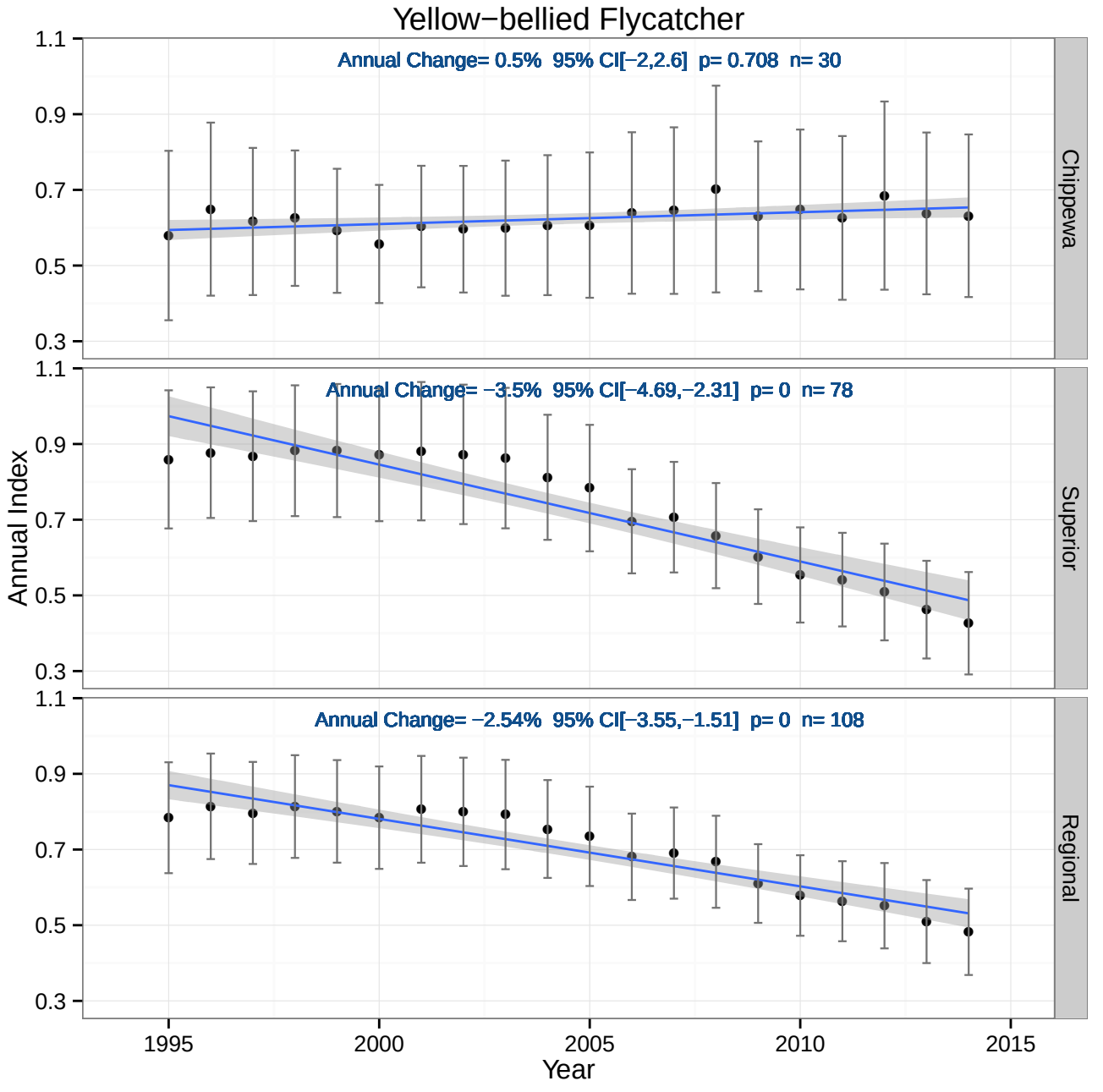

White−breasted Nuthatch
Annual Change= −1.45% 95% CI[−4.18,1.79] p= 0.388 n= 32
Annual Index
0.6
0.5
0.4
0.3
0.2
0.1
1995
2000
2005
2010
2015
Year
Chippewa

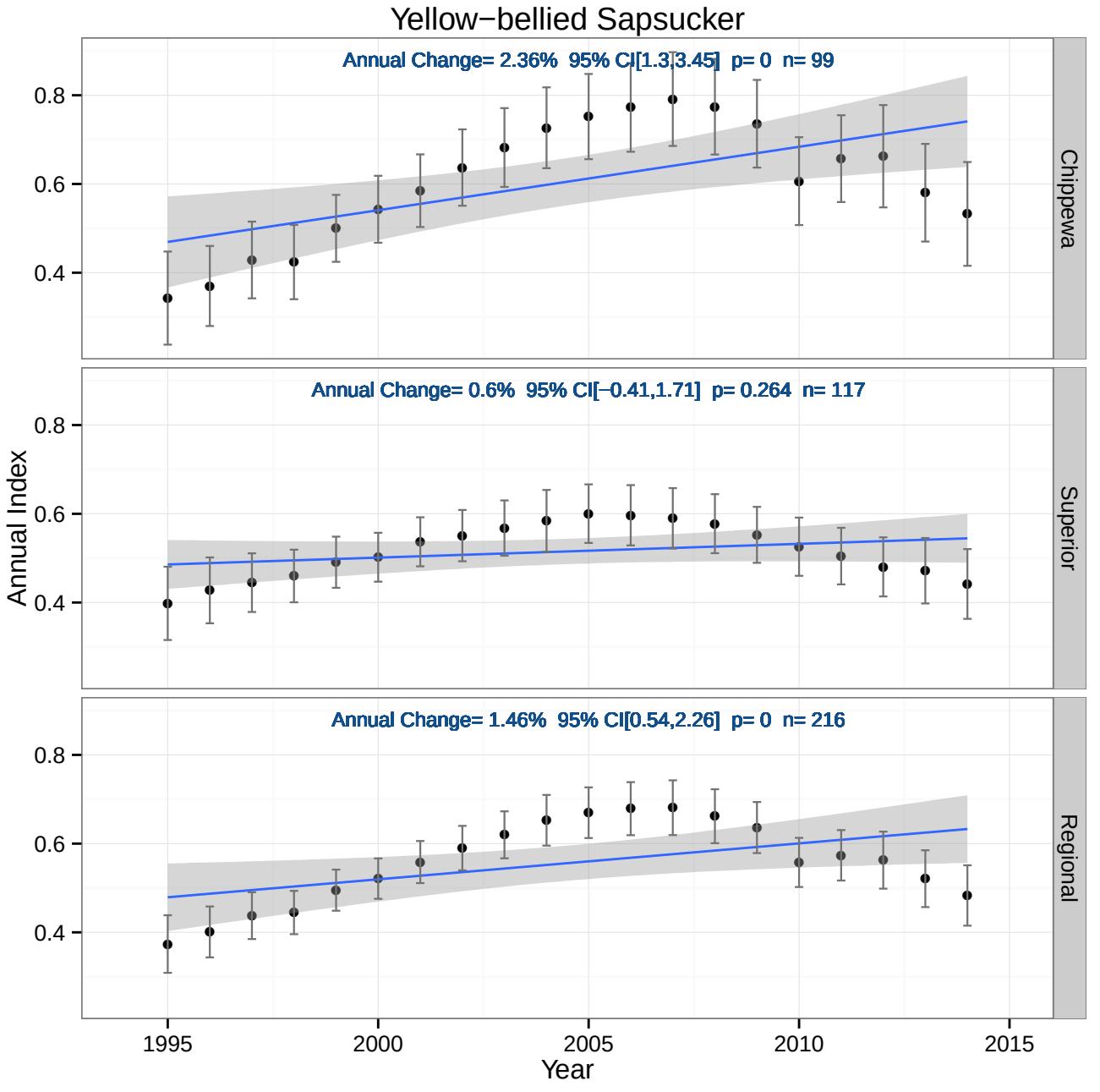

Winter Wren
Annual Change= −1.84% 95% CI[−3.15,−0.62] p= 0 n= 62
Annual Change= −0.04% 95% CI[−0.79,0.73] p= 0.92 n= 126
Annual Change= −0.63% 95% CI[−1.31,0.02] p= 0.06 n= 188
Chippewa
Superior
Regional
Annual Index
1.0
0.8
0.6
1995
2000
2005
2010
2015
Year

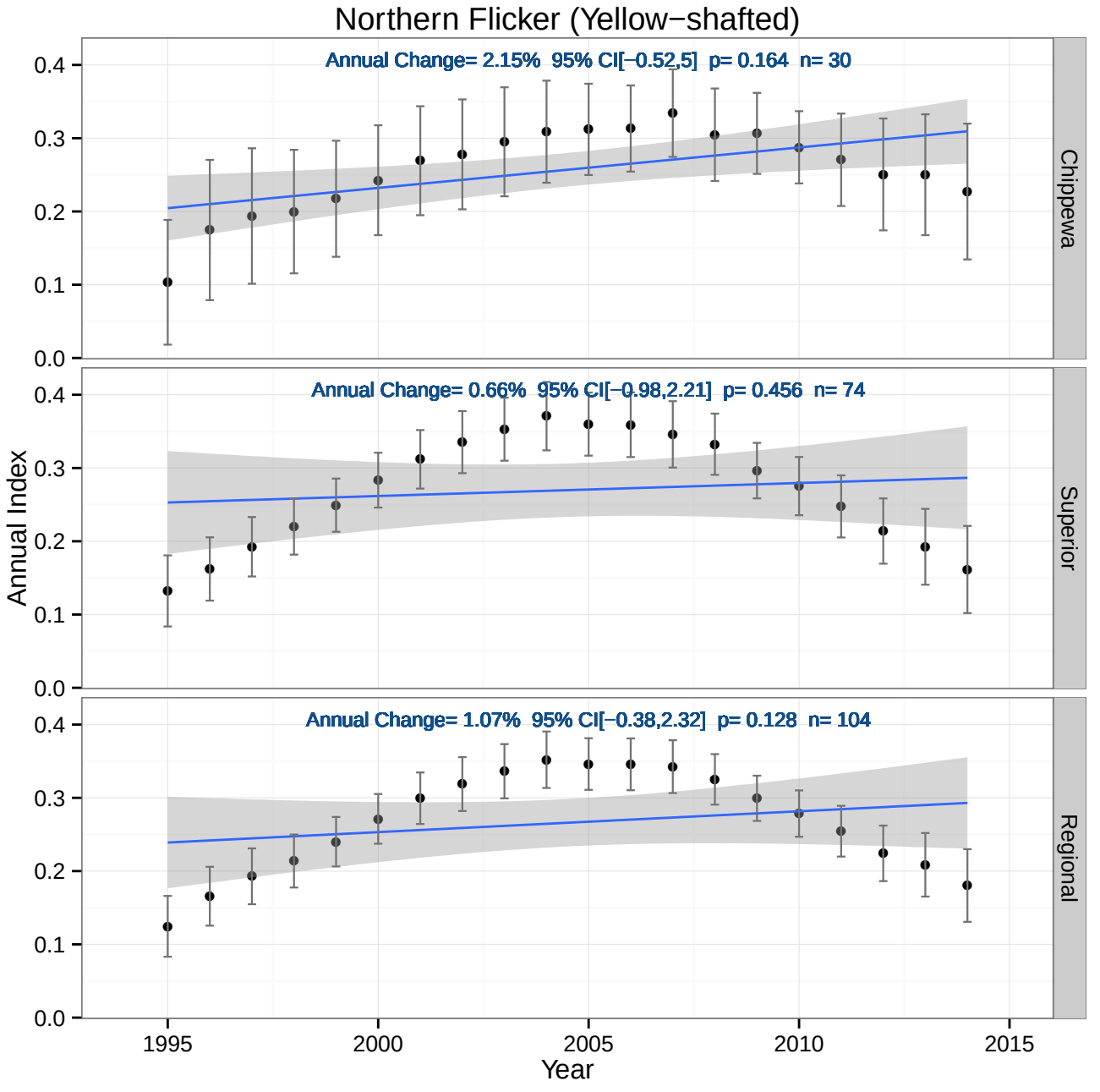

Wood Thrush
Annual Change= 3.84% 95% CI[0.66,8.06] p= 0.024 n= 16
Annual Change= −4.57% 95% CI[−10.92,2.27] p= 0.256 n= 5
Annual Change= 1.99% 95% CI[−1.31,5.82] p= 0.252 n= 21
Chippewa
Superior
Regional
Annual Index
1.0
0.5
0.0
1995
2000
2005
2010
2015
Year

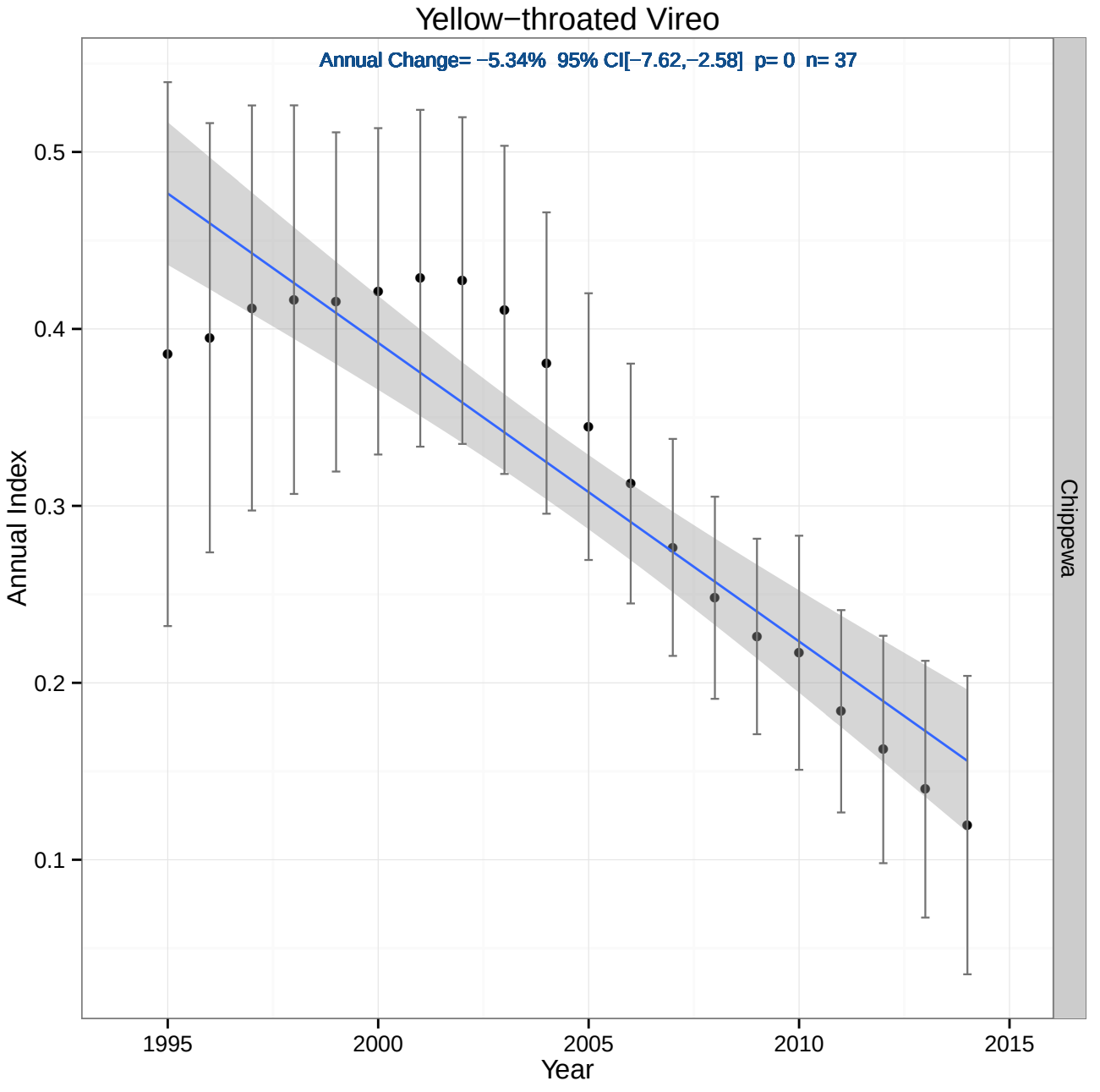

Palm Warbler (Western)
Annual Change= 2.06% 95% CI[−3.4,7.91] p= 0.588 n= 8
Annual Index
2.0
1.5
1.0
0.5
0.0
1995
2000
2005
2010
2015
Year
Chippewa

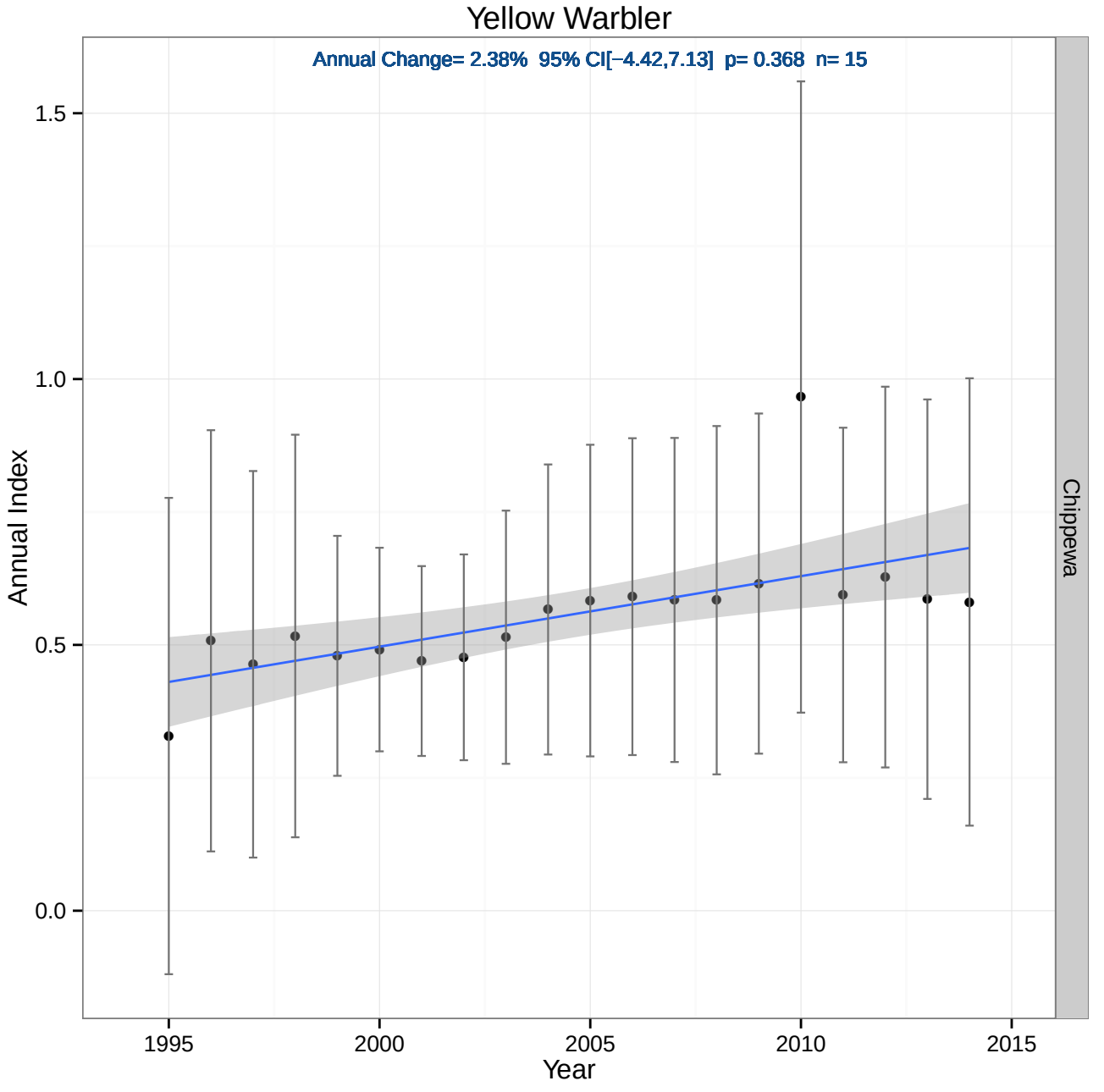

White−throated Sparrow
Annual Change= 0.89% 95% CI[−0.01,1.7] p= 0.052 n= 72
Annual Change= 0.99% 95% CI[0.28,1.75] p= 0.008 n= 147
Annual Change= 0.97% 95% CI[0.38,1.58] p= 0.004 n= 219
Chippewa
Superior
Regional
Annual Index
Year
1.5
2.0
2.5
3.0
3.5
1995
2000
2005
2010
2015


Yellow−bellied Flycatcher
Annual Change= 0.5% 95% CI[−2,2.6] p= 0.708 n= 30
Annual Change= −3.5% 95% CI[−4.69,−2.31] p= 0 n= 78
Annual Change= −2.54% 95% CI[−3.55,−1.51] p= 0 n= 108
Chippewa
Superior
Regional
Annual Index
Year
1.1
0.9
0.7
0.5
0.3
1995
2000
2005
2010
2015


Yellow−bellied Sapsucker
Annual Change= 2.36% 95% CI[1.3,3.45] p= 0 n= 99
Annual Change= 0.6% 95% CI[−0.41,1.71] p= 0.264 n= 117
Annual Change= 1.46% 95% CI[0.54,2.26] p= 0 n= 216
Chippewa
Superior
Regional
Annual Index
0.4
0.6
0.8
1995
2000
2005
2010
2015
Year


Northern Flicker (Yellow−shafted)
Annual Change= 2.15% 95% CI[−0.52,5] p= 0.164 n= 30
Annual Change= 0.66% 95% CI[−0.98,2.21] p= 0.456 n= 74
Annual Change= 1.07% 95% CI[−0.38,2.32] p= 0.128 n= 104
Chippewa
Superior
Regional
Annual Index
0.0
0.1
0.2
0.3
0.4
1995
2000
2005
2010
2015
Year


Yellow−throated Vireo
Annual Change= −5.34% 95% CI[−7.62,−2.58] p= 0 n= 37
Annual Index
0.5
0.4
0.3
0.2
0.1
1995
2000
2005
2010
2015
Year
Chippewa


Yellow Warbler
Annual Change= 2.38% 95% CI[−4.42,7.13] p= 0.368 n= 15
Annual Index
1.5
1.0
0.5
0.0
1995
2000
2005
2010
2015
Year
Chippewa

Appendix B. Population trend estimates (% annual change) and associa regional analaysis (1995-2014). Included for each species are its four le trend (P), the explained variation of the trend (R^2), and the number of

		Chippewa		
Species		Trend	P	R^2
Alder Flycatcher	ALFL	-1.34	0.28	0.23
American Crow	AMCR	0.00	0.91	0.00
American Goldfinch	AMGO	5.33	0.00	0.43
American Redstart	AMRE	0.93	0.23	0.19
American Robin	AMRO	-0.70	0.28	0.09
Black-and-white Warbler	BAWW	4.52	0.00	0.95
Black-billed Cuckoo	BBCU	-	-	-
Blackburnian Warbler	BLBW	0.77	0.45	0.45
Black-capped Chickadee	BCCH	0.61	0.28	0.02
Black-throated Blue Warbler	BTBW	-	-	-
Black-throated Green Warbler	BTNW	3.13	0.00	0.81
Blue Jay	BLJA	1.10	0.01	0.24
Blue-headed Vireo	BHVI	-0.82	0.53	0.06
Broad-winged Hawk	BWHA	-	-	-
Brown Creeper	BRCR	0.19	0.87	0.04
Brown-headed Cowbird	BHCO	-3.53	0.18	0.39
Canada Warbler	CAWA	4.87	0.02	0.73
Cape May Warbler	CMWA	-	-	-
Cedar Waxwing	CEDW	3.09	0.02	0.74
Chestnut-sided Warbler	CSWA	-0.18	0.75	0.00
Chipping Sparrow	CHSP	-2.06	0.00	0.15
Common Loon	COLO	-0.75	0.28	0.06
Common Raven	CORA	0.86	0.42	0.13
Common Yellowthroat	COYE	-0.52	0.45	0.06
Connecticut Warbler	CONW	-8.20	0.00	0.88
Downy Woodpecker	DOWO	-2.14	0.28	0.35
Eastern Wood-Pewee	EAWP	-0.93	0.08	0.39
Evening Grosbeak	EVGR	-	-	-
Golden-crowned Kinglet	GCKI	-0.19	0.86	0.00
Golden-winged Warbler	GWWA	-2.33	0.23	0.81
Gray Catbird	GRCA	-2.53	0.43	0.26
Gray Jay	GRAJ	1.53	0.48	0.47
Great Crested Flycatcher	GCFL	-2.04	0.10	0.75
Hairy Woodpecker	HAWO	1.65	0.30	0.44

Hermit Thrush	HETH	1.30	0.00	0.70
Indigo Bunting	INBU	-3.33	0.34	0.48
Least Flycatcher	LEFL	-1.51	0.03	0.43
Magnolia Warbler	MAWA	0.45	0.87	0.06
Mourning Dove	MODO	5.87	0.00	0.47
Mourning Warbler	MOWA	0.20	0.79	0.01
Nashville Warbler	NAWA	2.19	0.00	0.87
Northern Flicker (Yellow-shafted)	YSFL	2.15	0.16	0.32
Northern Parula	NOPA	1.77	0.06	0.62
Northern Waterthrush	NOWA	1.25	0.58	0.07
Olive-sided Flycatcher	OSFL	-3.36	0.24	0.38
Ovenbird	OVEN	1.95	0.00	0.63
Palm Warbler (Western)	WPWA	2.06	0.59	0.24
Pileated Woodpecker	PIWO	4.33	0.01	0.48
Pine Warbler	PIWA	2.54	0.00	0.95
Purple Finch	PUFI	-1.40	0.51	0.02
Red-breasted Nuthatch	RBNU	5.66	0.00	0.93
Red-eyed Vireo	REVI	0.31	0.05	0.02
Red-winged Blackbird	RWBL	-0.53	0.74	0.02
Rose-breasted Grosbeak	RBGR	0.56	0.48	0.04
Ruby-crowned Kinglet	RCKI	-	-	-
Ruby-throated Hummingbird	RTHU	-3.42	0.19	0.33
Ruffed Grouse	RUGR	-	-	-
Scarlet Tanager	SCTA	-1.27	0.01	0.32
Song Sparrow	SOSP	-6.02	0.00	0.86
Swainson's Thrush	SWTH	-	-	-
Swamp Sparrow	SWSP	-1.81	0.16	0.18
Tennessee Warbler	TEWA	-	-	-
Veery	VEER	1.47	0.01	0.42
White-breasted Nuthatch	WBNU	-1.45	0.39	0.21
White-throated Sparrow	WTSP	0.89	0.05	0.16
Wilson's Snipe	COSN	7.80	0.06	0.70
Winter Wren	WIWR	-1.84	0.00	0.93
Wood Thrush	WOTH	3.84	0.02	0.46
Yellow Warbler	YWAR	2.38	0.37	0.43
Yellow-bellied Flycatcher	YBFL	0.50	0.71	0.30
Yellow-bellied Sapsucker	YBSA	2.36	0.00	0.37
Yellow-rumped Warbler (Myrtle)	MYWA	0.94	0.16	0.12
Yellow-throated Vireo	YTVI	-5.34	0.00	0.84

ted test statistics for the Chippewa National Forest, Superior National Forest, and a co
tter 'alpha' code, its trend within each NF, a regional trend (if possible), the significan
stands (N) in which the species was detected sufficiently to include in the trend calcu

		Superior					Regional		
N		Trend	*P*	R^2	N		Trend	*P*	R^2
19		1.75	0.36	0.65	49		0.82	0.48	0.21
104		-2.23	0.01	0.46	66		-0.62	0.18	0.07
21		5.45	0.13	0.88	9		5.29	0.00	0.57
64		0.42	0.60	0.13	80		0.74	0.23	0.15
101		2.32	0.00	0.90	145		1.21	0.00	0.69
100		2.99	0.00	0.95	134		3.55	0.00	0.96
-		-0.20	0.85	0.00	5		-	-	-
75		0.27	0.57	0.13	131		0.42	0.40	0.28
99		1.59	0.01	0.12	126		1.08	0.01	0.06
-		-0.37	0.85	0.00	14		-	-	-
68		2.12	0.00	0.98	95		2.58	0.00	0.91
120		1.99	0.00	0.86	147		1.63	0.00	0.64
44		-0.03	0.98	0.00	44		-0.45	0.58	0.02
-		-8.65	0.02	0.98	6		-	-	-
45		-0.41	0.74	0.07	61		-0.09	0.94	0.01
15		-	-	-	-		-	-	-
19		0.53	0.33	0.11	95		1.07	0.10	0.30
-		7.30	0.00	0.73	30		-	-	-
39		3.82	0.01	0.57	44		3.45	0.00	0.67
105		-0.46	0.38	0.03	134		-0.34	0.40	0.02
70		-1.87	0.02	0.46	65		-2.00	0.00	0.21
72		-3.84	0.00	0.89	39		-1.71	0.02	0.33
54		-0.67	0.54	0.04	60		0.07	0.89	0.00
86		-0.04	1.00	0.00	67		-0.42	0.46	0.04
15		-6.62	0.00	0.95	5		-7.83	0.00	0.92
16		-9.14	0.03	0.69	6		-3.83	0.04	0.53
89		-0.92	0.54	0.56	27		-0.94	0.05	0.45
-		-9.57	0.00	0.99	10		-	-	-
24		3.25	0.00	0.74	73		2.42	0.00	0.50
29		3.19	0.16	0.47	12		-0.75	0.66	0.18
20		-	-	-	-		-	-	-
15		2.12	0.03	0.55	40		1.91	0.06	0.53
41		-	-	-	-		-	-	-
19		2.35	0.17	0.17	20		1.98	0.09	0.26

100		-0.44	0.28	0.06	137		0.44	0.08	0.11
20		-	-	-	-		-	-	-
81		0.79	0.41	0.19	99		-0.78	0.17	0.16
16		-0.61	0.28	0.10	118		-0.54	0.31	0.10
9		-	-	-	-		-	-	-
65		-1.50	0.02	0.34	123		-1.00	0.04	0.19
113		1.65	0.00	0.71	147		1.85	0.00	0.88
30		0.66	0.46	0.02	74		1.07	0.13	0.06
43		3.16	0.00	0.83	82		2.73	0.00	0.80
18		2.09	0.15	0.86	17		1.64	0.21	0.28
13		-2.66	0.04	0.18	5		-3.20	0.09	0.33
122		0.12	0.54	0.00	147		0.90	0.00	0.22
8		-	-	-	-		-	-	-
21		2.02	0.04	0.08	55		2.58	0.00	0.15
50		5.10	0.01	0.90	18		2.95	0.00	0.98
15		2.18	0.11	0.15	12		0.16	0.97	0.00
84		3.20	0.00	0.74	127		4.31	0.00	0.87
126		-1.03	0.00	0.15	147		-0.28	0.05	0.01
16		-0.05	0.90	0.00	7		-0.39	0.80	0.01
90		-0.32	0.61	0.08	124		0.02	0.96	0.00
-		8.86	0.00	0.98	33		-	-	-
6		-	-	-	-		-	-	-
-		2.10	0.18	0.11	38		-	-	-
89		-0.72	0.74	0.09	27		-1.15	0.04	0.26
46		-2.86	0.07	0.34	40		-4.65	0.00	0.70
-		-3.10	0.00	0.43	68		-	-	-
38		0.19	0.89	0.00	24		-1.28	0.22	0.08
-		9.90	0.00	0.50	12		-	-	-
102		-0.58	0.16	0.60	129		0.46	0.19	0.21
32		-	-	-	-		-	-	-
72		0.99	0.01	0.26	147		0.97	0.00	0.23
7		-2.37	0.47	0.28	9		2.42	0.42	0.32
62		-0.04	0.92	0.00	126		-0.63	0.06	0.32
16		-4.57	0.26	0.55	5		1.99	0.25	0.19
15		-	-	-	-		-	-	-
30		-3.50	0.00	0.88	78		-2.54	0.00	0.87
99		0.60	0.26	0.09	117		1.46	0.00	0.25
69		4.61	0.00	0.71	125		3.11	0.00	0.56
37		-	-	-	-		-	-	-

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Appendix C. Common and scientific name, abbreviation, migration strategy, nest site, and and typical habitat of each species tested in 2014.

Common Name	Scientific Name	Abbrev	Migration Strategy	Nest Site	Vegetation-type
Alder Flycatcher	*Empidonax alnorum*	ALFL	Long-distance	Shrub or Subcanopy	Early Successional
American Crow	*Corvus brachyrhynchos*	AMCR	Short-distance	Canopy	Deciduous Forest
American Goldfinch	*Carduelis tristis*	AMGO	Short-distance	Shrub or Subcanopy	Fields and Meadows
American Redstart	*Setophaga ruticilla*	AMRE	Long-distance	Shrub or Subcanopy	Early Successional
American Robin	*Turdus migratorius*	AMRO	Short-distance	Shrub or Subcanopy	Fields and Meadows
Black-and-white Warbler	*Mniotilta varia*	BAWW	Long-distance	Ground	Mixed Forest
Black-billed Cuckoo	*Coccyzus erythropthalmus*	BBCU	Long-distance	Subcanopy or Shrub	Deciduous forest
Blackburnian Warbler	*Setophaga fusca*	BLBW	Long-distance	Canopy	Coniferous Forest
Black-capped Chickadee	*Poecile atricapillus*	BCCH	Permanent Resident	Cavity	Deciduous Forest
Black-throated Blue Warbler	*Setophaga caerulescens*	BTBW	Long-distance	Shrub or Subcanopy	Deciduous Forest
Black-throated Green Warbler	*Setophaga virens*	BTNW	Long-distance	Canopy	Mixed Forest
Blue Jay	*Cyanocitta cristata*	BLJA	Permanent Resident	Canopy	Deciduous Forest
Blue-headed Vireo	*Vireo solitarius*	BHVI	Long-distance	Shrub or Subcanopy	Coniferous Forest
Broad-winged Hawk	*Euphagus cyanocephalus*	BWHA	Long-distance	Canopy	Mixed forest
Brown Creeper	*Certhia americana*	BRCR	Short-distance	Cavity	Deciduous Forest
Brown-headed Cowbird	*Molothrus ater*	BHCO	Short-distance	Brood Parasite	Fields and Meadows
Canada Warbler	*Cardellina canadensis*	CAWA	Long-distance	Ground	Mixed Forest
Cape May Warbler	*Setophaga tigrina*	CMWA	Long-distance	Canopy	Coniferous Forest
Cedar Waxwing	*Bombycilla cedrorum*	CEDW	Short-distance	Shrub or Subcanopy	Ponds, Lakes, Streams
Chestnut-sided Warbler	*Setophaga pensylvanica*	CSWA	Long-distance	Shrub or Subcanopy	Early Successional
Chipping Sparrow	*Spizella passerina*	CHSP	Short-distance	Canopy	Coniferous Forest
Common Loon	*Gavia immer*	COLO	Short-distance	Ground	Ponds, lakes, rivers, streams
Common Raven	*Corvus corax*	CORA	Permanent Resident	Canopy	Coniferous forest
Common Yellowthroat	*Geothlypis trichas*	COYE	Short-distance	Ground	Shrub Swamp
Connecticut Warbler	*Oporornis agilis*	CONW	Long-distance	Ground	Lowland Coniferous
Downy Woodpecker	*Picoides pubescens*	DOWO	Permanent Resident	Cavity	Deciduous Forest
Eastern Wood-Pewee	*Contopus virens*	EAWP	Long-distance	Canopy	Mixed Forest
Evening Grosbeak	*Coccothraustes vespertinus*	EVGR	Permanent Resident	Canopy	Mixed Forest
Golden-crowned Kinglet	*Regulus satrapa*	GCKI	Short-distance	Canopy	Coniferous Forest
Golden-winged Warbler	*Vermivora chrysoptera*	GWWA	Long-distance	Ground	Early Successional
Gray Catbird	*Dumetella carolinensis*	GRCA	Long-distance	Shrub or Subcanopy	Early Successional
Gray Jay	*Perisoreus canadensis*	GRAJ	Permanent Resident	Shrub or Subcanopy	Lowland Coniferous
Great Crested Flycatcher	*Myiarchus crinitus*	GCFL	Long-distance	Cavity	Deciduous Forest
Hairy Woodpecker	*Picoides villosus*	HAWO	Permanent Resident	Cavity	Deciduous Forest
Hermit Thrush	*Catharus guttatus*	HETH	Short-distance	Ground	Mixed Forest
Indigo Bunting	*Passerina cyanea*	INBU	Long-distance	Shrub or Subcanopy	Fields and Meadows
Least Flycatcher	*Empidonax minimus*	LEFL	Long-distance	Shrub or Subcanopy	Deciduous Forest
Magnolia Warbler	*Setophaga magnolia*	MAWA	Long-distance	Shrub or Subcanopy	Coniferous Forest
Mourning Dove	*Zenaida macroura*	MODO	Short-distance	Canopy	Fields and meadows
Mourning Warbler	*Geothlypis philadelphia*	MOWA	Long-distance	Ground	Early Successional
Nashville Warbler	*Oreothlypis ruficapilla*	NAWA	Long-distance	Ground	Lowland Coniferous
Northern Flicker (Yellow-shafted)	*Colaptes auritus*	YSFL	Short-distance	Cavity	Fields and Meadows
Northern Parula	*Setophaga americana*	NOPA	Long-distance	Canopy	Lowland Coniferous
Northern Waterthrush	*Parkesia noveboracensis*	NOWA	Long-distance	Ground	Lowland Coniferous
Olive-sided Flycatcher	*Contopus cooperi*	OSFL	Long-distance	Canopy	Early Successional
Ovenbird	*Seiurus aurocapilla*	OVEN	Long-distance	Ground	Deciduous Forest
Palm Warbler (Western)	*Setophaga palmarum*	WPWA	Long-distance	Ground	Lowland Coniferous
Pileated Woodpecker	*Dryocopus pileatus*	PIWO	Permanent Resident	Cavity, Hole, or Bank	Deciduous forest
Pine Warbler	*Setophaga pinus*	PIWA	Short-distance	Canopy	Coniferous Forest
Purple Finch	*Carpodacus purpureus*	PUFI	Permanent Resident	Canopy	Mixed Forest
Red-breasted Nuthatch	*Sitta canadensis*	RBNU	Permanent Resident	Cavity	Coniferous Forest
Red-eyed Vireo	*Vireo olivaceus*	REVI	Long-distance	Shrub or Subcanopy	Deciduous Forest
Red-winged Blackbird	*Agelaius phoeniceus*	RWBL	Short-distance	Shrub or Subcanopy	Ponds, Lakes, Streams
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	RBGR	Long-distance	Shrub or Subcanopy	Deciduous Forest
Ruby-crowned Kinglet	*Regulus calendula*	RCKI	Short-distance	Canopy	Coniferous Forest
Ruby-throated Hummingbird	*Archilochus colubris*	RTHU	Long-distance	Canopy	Ponds, lakes, rivers, streams
Ruffed Grouse	*Bonasa umbellus*	RUGR	Permanent Resident	Ground	Deciduous Forest
Scarlet Tanager	*Piranga olivacea*	SCTA	Long-distance	Canopy	Deciduous Forest
Song Sparrow	*Melospiza melodia*	SOSP	Short-distance	Ground	Fields and Meadows
Swainson's Thrush	*Catharus ustulatus*	SWTH	Long-distance	Shrub or Subcanopy	Lowland Coniferous
Swamp Sparrow	*Melospiza georgiana*	SWSP	Short-distance	Ground	Early Successional
Tennessee Warbler	*Oreothlypis peregrina*	TEWA	Long-distance	Ground	Lowland Coniferous
Veery	*Catharus fuscescens*	VEER	Long-distance	Ground	Deciduous Forest
White-breasted Nuthatch	*Sitta carolinensis*	WBNU	Permanent Resident	Cavity	Deciduous Forest
White-throated Sparrow	*Zonotrichia albicollis*	WTSP	Short-distance	Ground	Early Successional
Wilson's Snipe	*Gallinago delicata*	COSN	Short-distance	Ground	Open wetlands
Winter Wren	*Troglodytes troglodytes*	WIWR	Short-distance	Ground	Lowland Coniferous
Wood Thrush	*Hylocichla mustelina*	WOTH	Long-distance	Shrub or Subcanopy	Deciduous Forest
Yellow Warbler	*Setophaga petechia*	YWAR	Long-distance	Shrub or Subcanopy	Shrub Swamp
Yellow-bellied Flycatcher	*Empidonax flaviventris*	YBFL	Long-distance	Ground	Lowland Coniferous
Yellow-bellied Sapsucker	*Sphyrapicus varius*	YBSA	Short-distance	Cavity	Deciduous Forest
Yellow-rumped (Myrtle) Warbler	*Setophaga coronata*	MYWA	Short-distance	Canopy	Coniferous Forest
Yellow-throated Vireo	*Vireo flavifrons*	YTVI	Long-distance	Canopy	Deciduous Forest

Appendix D. Number of observations on the Chippewa National Forest for species not tested for population trends in 2014. Includes flyovers and all birds regardless of distance.

Species	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
American Bittern					1														1	
American Kestrel								1			1							1		
American White Pelican					1				2				3	7						
American Woodcock									2		2			2				1	1	
Bald Eagle		1			1	1	1	1			1	1	2		2			1		
Baltimore Oriole	5	5	1	2	2	5	1	2	11	1	1	3	2				1	3		
Bank Swallow														2						
Barn Swallow						2		1												
Barred Owl				3	1	2		2	4	3	1	5	2	1		1	2	3	3	2
Bay-breasted Warbler														3		1	1			4
Belted Kingfisher		3	3	1	1		4	5	3	2	1	3	4			2			1	
Black-backed Woodpecker	1			1	3	2	2	4	1	2			13		1					3
Black-billed Cuckoo	3	1	2		9	2	2	7	2	1		21	11	3			2		5	1
Blackpoll Warbler			1											1						
Black-throated Blue Warbler	2		2	1	3						1	1								
Blue-winged Warbler																				2
Boreal Chickadee	1						1	4	4	4	5									
Brewer's Blackbird				3		3	6	4												
Broad-winged Hawk	4	5	2	6	1	4	6	7	8	10	5	5	8	6	3	2	2	5	9	8
Brown Thrasher						1	1				2			2	7		1			
Canada Goose					2		3		4			2	2	2	1	1		1	55	2
Cape May Warbler	2				4		1	1	2			1	1	4	7			2	6	
Chimney Swift				1		2	2	3					2	3	1	2	1			
Clay-colored Sparrow			2	2			10	10	8	5	6		7		6		4			
Cliff Swallow						12														
Common Grackle	1	1		2	9	14	2	2	5		3	6	7	2	1	1	3	2		10
Common Merganser						1			9				1				2			
Common Nighthawk	1				5	3			2			1					1		3	
Cooper's Hawk					1		1	2		1			1							
Dark-eyed Junco (Slate-colored)	10	3	1	1		4		5	1			1		2	6		3		1	15
Eastern Bluebird				2	1	4	3	9	5		2		1					2	2	
Eastern Kingbird	4		3	4	3		3	3	2	6	11	6	5	2	3	3	1		1	2
Eastern Phoebe	1	2	3	2	2	5		2	5	3	5	4	2	3	6	2	3	2	2	
Eastern Towhee	5	2	1	1	8	3	7	7	1	6		7	12	1			4	2		4
Evening Grosbeak		3	3	14	20	34	1	14	6	9	9	8	2							
Field Sparrow														1						
Great Blue Heron	2				4	4	4		6	5	4	4	1		3		3	2		2
Great Gray Owl						1					1									
Great Horned Owl						1		2							1				1	
Green Heron								2	1			2								
Green-winged Teal					5								1							
Herring Gull						2						1						1		2
Hooded Merganser								1					2							
House Wren	1			1	6	2	4	1	6	3	2	2	8	1	1				9	1
Killdeer	1		1			1		2	1				1			3				
Lesser Scaup														1						
Lincoln's Sparrow	1	2	2	4	1	6	1	1		10	7	8	5	5	5	12	1	4	9	7
Long-eared Owl												3								
Mallard		1			9	7	1	1	1		1	8	1	1	1					
Marsh Wren														1	1				1	
Merlin				1					1								1	1		
Northern Goshawk												2				2				
Northern Harrier					1															
Osprey	1				1	1	1		1											
Pied-billed Grebe							7				2	1		3	2			7	1	1
Pine Siskin	1	4	1		9	23	2	3			10	1	9	3	4		1	3		2
Purple Martin					1					3										
Red Crossbill						2	26			2	11	27	5	11						
Red-bellied Woodpecker												1		2	1		4	1	2	2
Red-headed Woodpecker			1					1								1				
Red-shouldered Hawk		1					1							1						
Red-tailed Hawk	2	1	2	3	4		11	1	7	2	5	2		3	4	3		1	1	1
Ring-billed Gull						3					1			3		1	3			
Ring-necked Duck							2													
Ruby-crowned Kinglet	3		2	4	3	1		2			2		1	5	15	7		4	3	3
Ruffed Grouse	6	7	4	18	13	1	10	3	9	4		5	2	2	3	8	1	2	6	1
Sandhill Crane								8			1	2			2	3	3	1	1	2
Savannah Sparrow				1																
Sedge Wren	1	5	4	4	3	1	5	3		5	1		5	3	1				8	1
Sharp-shinned Hawk			4																	
Sharp-tailed Grouse																4				
Solitary Sandpiper					1															
Sora					1	2	1	2							1		1			
Swainson's Thrush	7	1	2	17	5	4	2	4	13			1		1	1	7	4	1	7	1
Tennessee Warbler					2	2							1	8			2			9
Tree Swallow		1			1	9	2	1		3	1	3	6						2	3
Trumpeter Swan																	4		1	
Turkey Vulture		1				1		1		1	1		1						2	
Vesper Sparrow	1									1			8		1					1
Virginia Rail												1								
Warbling Vireo		2	3	1							3	2	1			1	1	4	4	
Whip-poor-will					2								2				1		1	
White-winged Crossbill	1	23		1		50							2	81	8					
Wild Turkey														1		2				
Willow Flycatcher	2	1		1																
Wilson's Warbler															4					2
Wood Duck					1	1	14	1	4			1							1	4
Yellow-billed Cuckoo	8		1	22			2					1		1		3				

Appendix E. Number of observations on the Superior National Forest for species not tested for population trends in 2014. Includes flyovers and all birds regardless of distance.

Species	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
American Bittern		2	18	9		1	3	3	13	14	4	13	1	2	12	6	2	4	6	9	6
American Black Duck										2	2										
American Kestrel			1			1		1	1	1											
American Three-toed Woodpecker																		1			
American White Pelican				4																	
American Woodcock				1							2				2	1			2		
Bald Eagle							1		1					1					2	1	1
Baltimore Oriole			4	4	2	2	1	1	4	3			1		2				7		
Bank Swallow								1													
Barn Swallow								1													
Barred Owl		1		5		5				1	1	1		4		3	1	1	2	1	1
Bay-breasted Warbler		8	10			4									2				1	2	14
Belted Kingfisher		2	5	1	2	2	4		3	5	1	1	2	2	2	10	4	8	6		2
Black-backed Woodpecker						1	4	5	3	5	3	2	2	8	2			1	4		6
Blackpoll Warbler		1													2						
Blue-winged Teal																				1	
Bobolink															1						
Boreal Chickadee			1			1		2	3	6	8	5		7	8	6	4	1	8	11	5
Boreal Owl														1							
Brewer's Blackbird				1				1													
Brown Thrasher		1	3	2	1							1							1		
Brown-headed Cowbird		3	3	1		7	1	1	4	4	1				1		1				
Canada Goose				1	1	2			26	7	2	2		2	3	6		5	27	98	16
Chimney Swift												3		2	1	1	2		1		
Clay-colored Sparrow				1	1				5	2	1	1	1								1
Common Goldeneye									3	1		1						1			
Common Grackle			3		2			6	8	4	1	1	7	1	1	2	3	4	6	1	1
Common Merganser							3		5	1	4		1	1	1					4	1
Common Nighthawk			1			3	1				1		1								
Cooper's Hawk													1			1					
Dark-eyed Junco (Slate-colored)		9	5	2	3	2	1	9	1	5	2	1	3	8	4	11		3	21	11	16
Eastern Bluebird									1		2		1								
Eastern Kingbird		4	1		2	1			7	1	1	1						3	3		
Eastern Phoebe		1	2			2	2	3	1	1	1	1	2	2	8	3	6		2	1	1
Gray Catbird			3	1	1		6	1	2		1		2		3	1	2	4	3	1	2
Great Blue Heron											1		2	3	1	3			1		3
Great Crested Flycatcher		10	8	13	4	2	13	4	3	10	4	2	3	7	24	3	20	4	6	1	7
Great Gray Owl												1									
Great Horned Owl						1					2										
Green Heron							1														
Green-winged Teal									11										1		
Herring Gull						6			2				2								
Hooded Merganser																			3		
House Wren		4	2	1	1	3		1	1		2			1	2				2		
Indigo Bunting				4	4	7	1	4	10	12	6	10	3	10	5	1			1	4	
Killdeer			4	1	3				2		1							6	2		
Lesser Scaup																1					
Lincoln's Sparrow		3	5	1	4	1	10	4	5		6	12	4	3	12	7	11	6	4	2	10
Mallard			1	1	2	1	4	8	7	3		2		1	3			2	8	3	
Marsh Wren											1								1		
Merlin							1	2					1						1		
Mourning Dove							1	1		1					5	4					
Northern Goshawk																			1		
Northern Hawk Owl								1													
Northern Pintail																			1		
Northern Rough-winged Swallow										1											
Osprey													1						2		
Palm Warbler (Western)			7	1	5	2		3	3			1		1			4		5	8	1
Philadelphia Vireo		1																			
Pied-billed Grebe				1				1	5			1	2		1		1		1	2	2
Pine Siskin		6	2	2		6	23	3	10	4	3	10	1	41	8	29		9	31	1	11
Red Crossbill				1			1	5			2	4	11	21	4	3			3		1
Red-bellied Woodpecker							1										1		1		
Red-headed Woodpecker					1																
Red-shouldered Hawk							2														
Red-tailed Hawk						1						1	1	1		1					
Ring-billed Gull			3				12			1					2	3					
Ring-necked Duck									3												
Ruby-throated Hummingbird		1	2	4	4	2	8	4	8	7	4	10	6	10	5	20	9	14	11	9	5
Sandhill Crane					2											1		2		1	
Savannah Sparrow												1			2	1				1	
Sedge Wren		4	2				3	1	2		9	2	3	3	8	2				1	
Sharp-shinned Hawk							1				1			3	1				1		
Solitary Sandpiper								1													
Sora									1										1		
Spruce Grouse							1			1	2				1		1	2		1	
Tree Swallow						2	1				2						1		1		
Trumpeter Swan																			2		
Turkey Vulture		1			2			1			3	1		4	1			2	1	1	1
Vesper Sparrow		2	6									1		1							
Virginia Rail																1				1	
Whip-poor-will			1							1							1		1		
White-breasted Nuthatch		1	6	3	1		5	1	3	13	3	4	3		8	14	11	2	54	5	2
White-winged Crossbill			1		2		10	3	4	14	3	1		5	173	5			1	19	
Wild Turkey																	1				
Wilson's Warbler		1		1											1	5				1	2
Wood Duck							1	1								1		2	4		
Yellow Warbler		6	1		1			1	2	3		1	1		5	5	3	2	20	10	4
Yellow-billed Cuckoo		2		1	3	1											1				
Yellow-throated Vireo		2	5				4	1		3			1		2				2		

Table 1. Trends for two National Fo
smoothed annual index of abundanc
significantly decreasing. *$P \leq 0.05$, **
tes

Alder Flycatcher
American Crow
American Goldfinch
American Redstart
American Robin
Black-and-white Warbler
Blackburnian Warbler
Black-billed Cuckoo
Black-capped Chickadee
Black-throated Blue Warbler
Black-throated Green Warbler
Blue Jay
Blue-headed Vireo
Broad-winged Hawk
Brown Creeper
Brown-headed Cowbird
Canada Warbler
Cape May Warbler
Cedar Waxwing
Chestnut-sided Warbler
Chipping Sparrow
Common Loon
Common Raven
Common Yellowthroat

Connecticut Warbler
Downy Woodpecker
Eastern Wood-Pewee
Evening Grosbeak
Golden-crowned Kinglet
Golden-winged Warbler
Gray Catbird
Gray Jay
Great Crested Flycatcher
Hairy Woodpecker
Hermit Thrush
Indigo Bunting
Least Flycatcher
Magnolia Warbler
Mourning Dove
Mourning Warbler
Nashville Warbler
Northern Flicker (Yellow-shafted)
Northern Parula
Northern Waterthrush
Olive-sided Flycatcher
Ovenbird
Palm Warbler (Western)
Pileated Woodpecker
Pine Warbler
Purple Finch
Red-breasted Nuthatch
Red-eyed Vireo
Red-winged Blackbird
Rose-breasted Grosbeak
Ruby-crowned Kinglet
Ruby-throated Hummingbird

Ruffed Grouse
Scarlet Tanager
Song Sparrow
Swainson's Thrush
Swamp Sparrow
Tennessee Warbler
Veery
White-breasted Nuthatch
White-throated Sparrow
Wilson's Snipe
Winter Wren
Wood Thrush
Yellow Warbler
Yellow-bellied Flycatcher
Yellow-bellied Sapsucker
Yellow-rumped Warbler (Myrtle)
Yellow-throated Vireo

›rests (NF) and pooled NF's based on linear regression of loess-
e (See Methods) (1995- 2014). I= significantly increasing, D=
$P \leq 0.01$. See Appendix A for species graphs and Appendix B for
st statistics and sample sizes.

Chippewa NF	Superior NF	Regional
ns	ns	ns
ns	D**	ns
I**	ns	I**
ns	ns	ns
ns	I**	I**
I**	I**	I**
ns	ns	ns
-	ns	-
ns	I*	I**
-	ns	-
I**	I**	I**
I*	I**	I**
ns	ns	ns
-	D*	-
ns	ns	ns
ns	-	-
I*	ns	ns
-	I**	-
I*	I*	I**
ns	ns	ns
D**	D*	D**
ns	D**	D*
ns	ns	ns
ns	ns	ns

D**	D**	D**
ns	D*	D*
ns	ns	ns
-	D**	-
ns	I**	I**
ns	ns	ns
ns	-	-
ns	I*	ns
ns	-	-
ns	ns	ns
I**	ns	ns
ns	-	-
D*	ns	ns
ns	ns	ns
I**	-	-
ns	D*	D*
I**	I**	I**
ns	ns	ns
ns	I**	I**
ns	ns	ns
ns	D*	ns
I**	ns	I**
ns	-	-
I**	I*	I**
I**	I**	I**
ns	ns	ns
I**	I**	I**
I*	D**	ns
ns	ns	ns
ns	ns	ns
-	I**	-
ns	-	-

-	ns	-
D*	ns	D*
D**	ns	D**
-	D**	-
ns	ns	ns
-	I**	-
I**	ns	ns
ns	-	-
ns	I**	I**
ns	ns	-
D**	ns	ns
I*	ns	ns
ns	-	-
ns	D**	D**
I**	ns	I**
ns	I**	I**
D**	-	-

Table 2. Species with significantly increa
regression of loess-smoothed annua

Chippewa NF
American Goldfinch**
Black-and-white Warbler**
Black-throated Green Warbler**
Blue Jay
Canada Warbler
Cedar Waxwing
Hermit Thrush**
Mourning Dove
Nashville Warbler**
Ovenbird**
Pileated Woodpecker**
Pine Warbler**
Red-breasted Nuthatch**
Red-eyed Vireo
Veery**
Wood Thrush
Yellow-bellied Sapsucker**

ısing trends ($P \leq 0.05$) for two national forests and region-wide (1995-2014), based on
ıl index of abundance. $^{**}P \leq 0.01$. Species graphs can be found in Appendix A.

Superior NF	Regional
American Robin**	American Goldfinch**
Black-and-white Warbler**	American Robin**
Black-capped Chickadee	Black-and-white Warbler**
Black-throated Green Warbler**	Black-capped Chickadee**
Blue Jay**	Black-throated Green Warbler**
Cape May Warbler**	Blue Jay**
Cedar Waxwing	Cedar Waxwing**
Golden-crowned Kinglet**	Golden-crowned Kinglet**
Gray Jay	Nashville Warbler**
Nashville Warbler**	Northern Parula**
Northern Parula**	Ovenbird**
Pileated Woodpecker	Pileated Woodpecker**
Pine Warbler**	Pine Warbler**
Red-breasted Nuthatch**	Red-breasted Nuthatch**
Ruby-crowned Kinglet**	White-throated Sparrow**
Tennessee Warbler**	Yellow-bellied Sapsucker**
White-throated Sparrow**	Yellow-rumped Warbler (Myrtle)**
Yellow-rumped Warbler (Myrtle)**	

Table 3. Summary of species with increasing trends ($P \leq 0.05$) on two national forests (1995-2014). Individual species graphs can be found in Appendix A.

Increased in one NF	**Increased in both NFs**
American Goldfinch	Black-and-white Warbler
American Robin	Black-throated Green Warbler
Black-capped Chickadee	Blue Jay
Canada Warbler	Cedar Waxwing
Cape May Warbler	Nashville Warbler
Golden-crowned Kinglet	Pileated Woodpecker
Gray Jay	Pine Warbler
Hermit Thrush	Red-breasted Nuthatch
Mourning Dove	
Northern Parula	
Ovenbird	
Red-eyed Vireo	
Ruby-crowned Kinglet	
Tennessee Warbler	
Veery	
White-throated Sparrow	
Wood Thrush	
Yellow-rumped Warbler (Myrtle)	
Yellow-bellied Sapsucker	

X

Table 4. Species with significantly de
on regression of loess-smoothed ann

Chippewa NF
Chipping Sparrow**
Connecticut Warbler**
Least Flycatcher
Scarlet Tanager
Song Sparrow**
Winter Wren**
Yellow-throated Vireo**

ecreasing trends ($P < 0.05$) for two national forests (1995-2014), based ual index of abundance. $^{**}P < 0.01$. Species graphs can be found in Appendix A.

Superior NF	Regional
American Crow**	Chipping Sparrow**
Broad-winged Hawk	Common Loon
Chipping Sparrow	Connecticut Warbler**
Common Loon**	Downy Woodpecker
Connecticut Warbler**	Mourning Warbler
Downy Woodpecker	Scarlet Tanager
Evening Grosbeak**	Song Sparrow**
Mourning Warbler	Yellow-bellied Flycatcher**
Olive-sided Flycatcher	
Red-eyed Vireo**	
Swainson's Thrush**	
Yellow-bellied Flycatcher**	

Table 5. Species with marginally significa
2013), based on regression of loess-smoo
negative-

Chippewa NF
Eastern Wood-Pewee (-)
Northern Parula (+)
White-throated Sparrow (+)
Wilson's Snipe (+)

ntly increasing trends ($0.05 < P \leq 0.10$) for two national forests and region-wide (1995-
thed annual index of abundance. Direction of trend indicated by either positive (+) or
sign (-). Species graphs can be found in Appendix A.

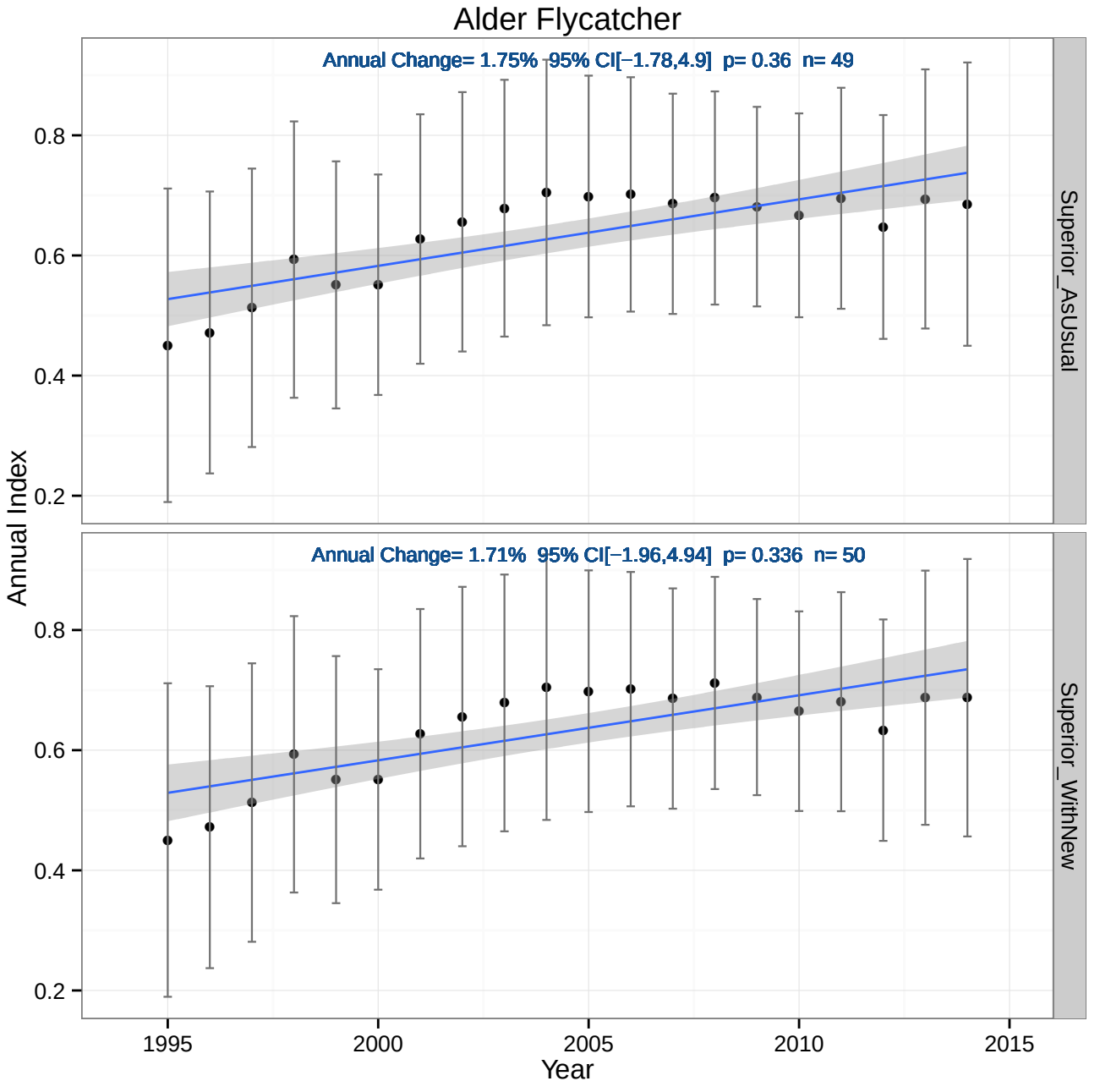
Superior NF	Regional
Song Sparrow (-)	Eastern Wood-Pewee (-)
	Gray Jay (+)
	Hairy Woodpecker (+)
	Hermit Thrush (+)
	Olive-sided Flycatcher (-)
	Red-eyed Vireo (-)
	Winter Wren (-)

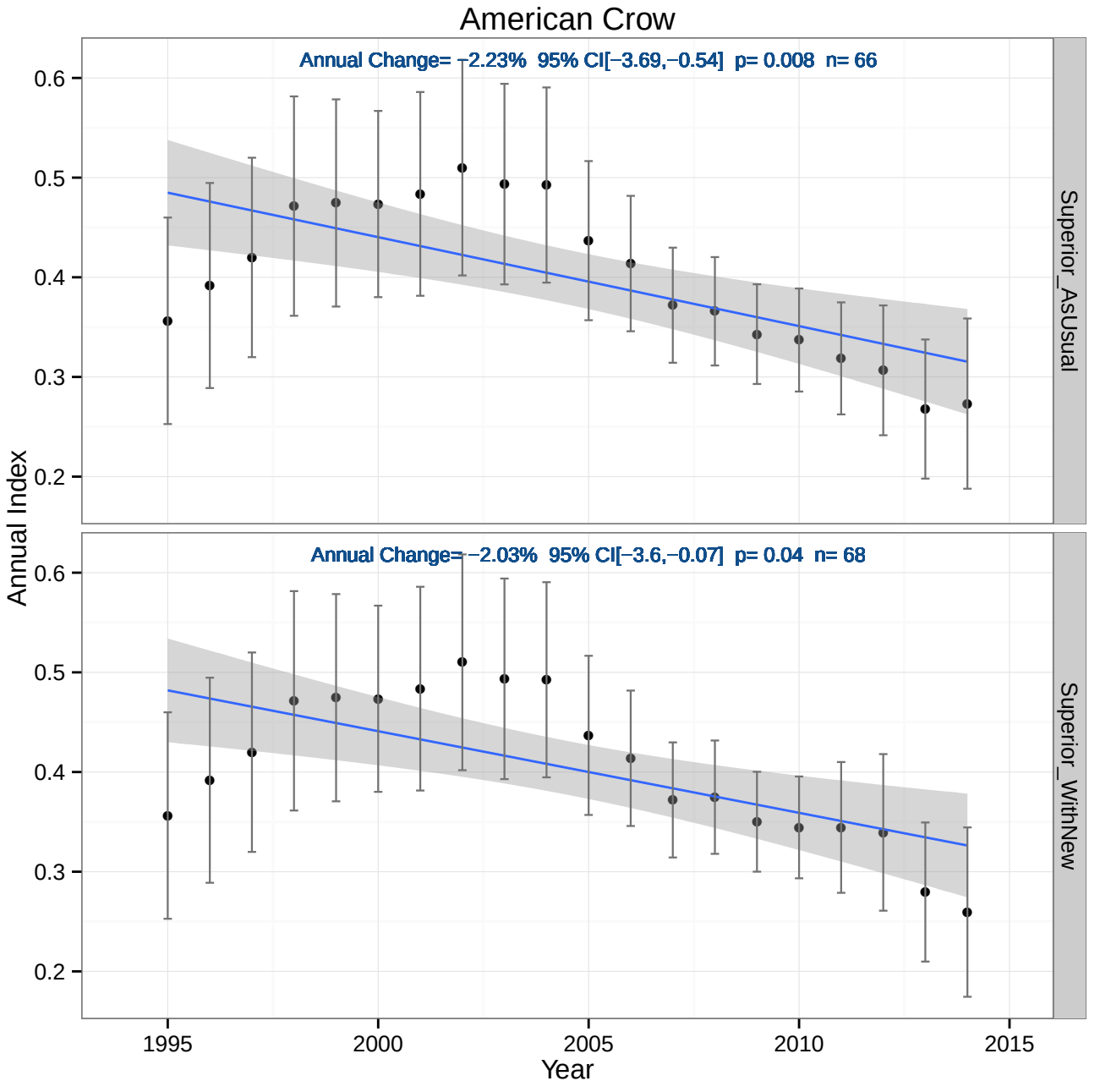
Table 6. Test statistics and sample sizes for guild trend analyses on two National For
combined within each guild category and analyzed as a group, regardless of whether
percent annual change in population trend. N= number of stands

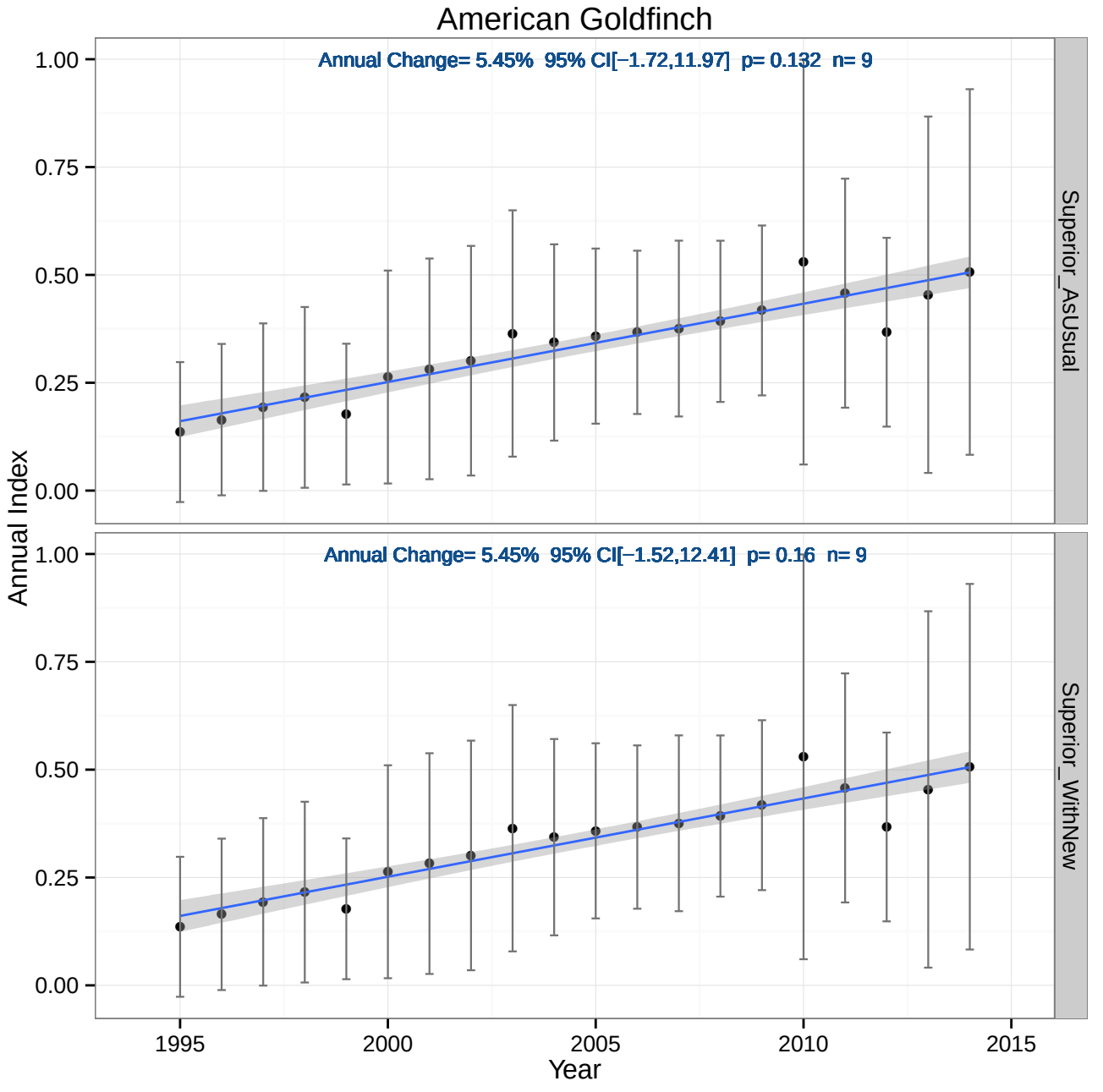
	Chippewa NF				
Guild Category	Trend	*P*	R^2	N	Trend
Short distance migrants	0.17	0.44	0.01	126	1.17
Long distance migrants	0.74	<0.01	0.17	126	0.19
Permanent residents	1.58	<0.01	0.32	126	2.15
Ground nesting	1.06	<0.01	0.43	126	0.40
Shrub/Sub-canopy nesting	0.01	0.99	0.00	126	-0.01
Canopy nesting	0.52	0.01	0.10	126	2.01
Cavity nesting	1.84	<0.01	0.34	126	1.76
Coniferous forest	1.24	<0.01	0.42	123	1.91
Lowland coniferous	1.00	<0.01	0.61	119	0.83
Deciduous forest	0.75	<0.01	0.12	126	0.11
Early-succession	0.15	0.69	0.00	125	0.24
Mixed forest	1.75	0.00	0.72	126	1.05

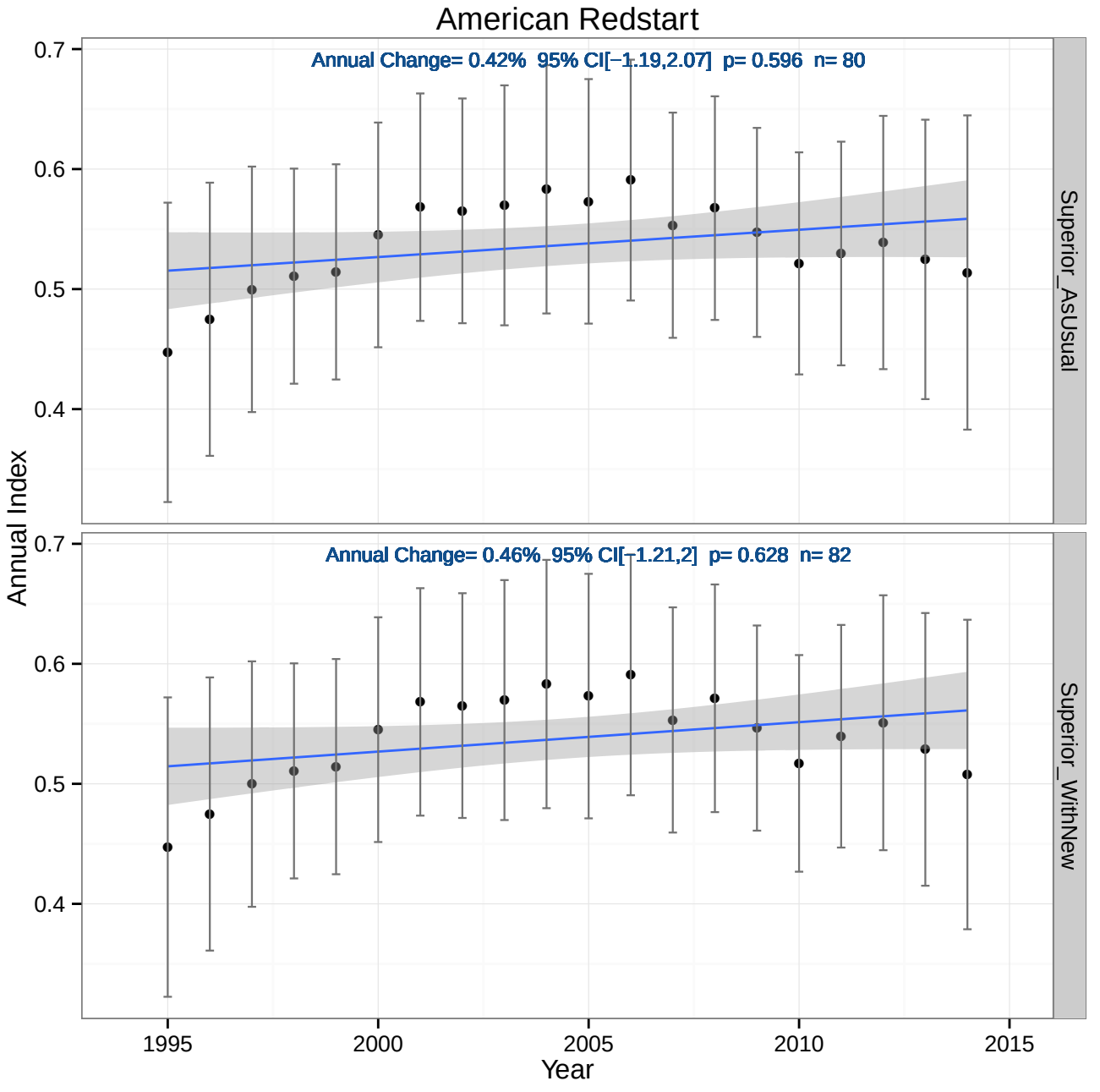
ests and a combined regional analysis (1995-2014). All species
a species meets criteria for individual species analyses. Trend=
analyzed. See appendix A for trend graphs.

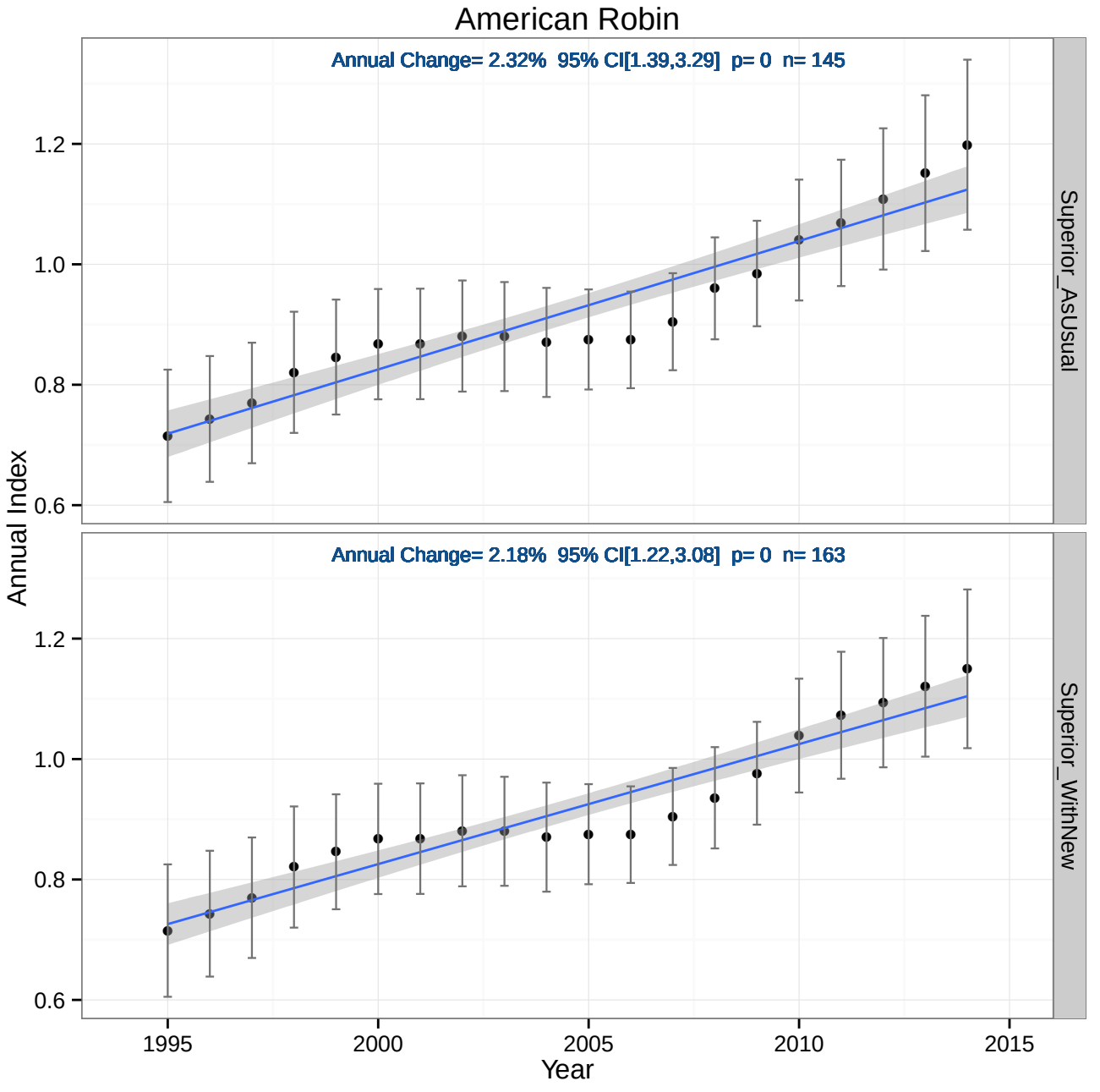
Superior NF			**Regional**			
P	R^2	N	Trend	*P*	R^2	N
<0.01	0.49	147	0.73	<0.01	0.20	273
0.04	0.02	147	0.44	<0.01	0.08	273
<0.01	0.65	147	1.90	<0.01	0.50	273
<0.01	0.08	147	0.67	<0.01	0.22	273
0.95	0.00	147	-0.01	0.96	0.00	273
<0.01	0.97	147	1.26	<0.01	0.62	273
<0.01	0.28	147	1.80	<0.01	0.30	273
<0.01	0.93	147	1.63	<0.01	0.78	270
<0.01	0.35	147	0.90	<0.01	0.57	266
0.41	0.00	147	0.43	<0.01	0.05	273
0.48	0.02	147	0.21	0.52	0.01	272
<0.01	0.59	147	1.37	<0.01	0.68	273

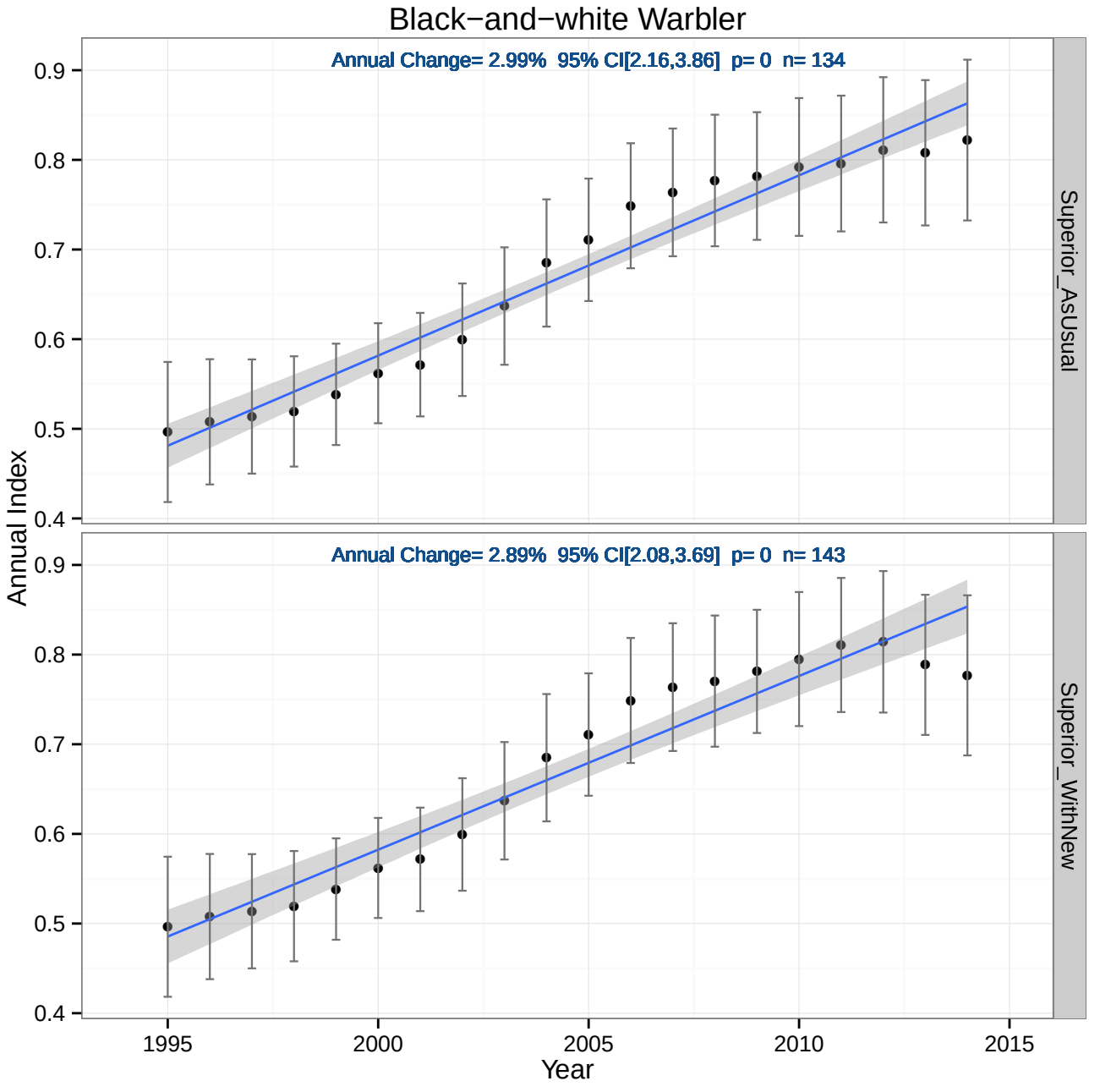

Alder Flycatcher
Annual Change= 1.75% 95% CI[−1.78,4.9] p= 0.36 n= 49
Annual Change= 1.71% 95% CI[−1.96,4.94] p= 0.336 n= 50
Superior_AsUsual
Superior_WithNew
Annual Index
0.2
0.4
0.6
0.8
1995
2000
2005
2010
2015
Year

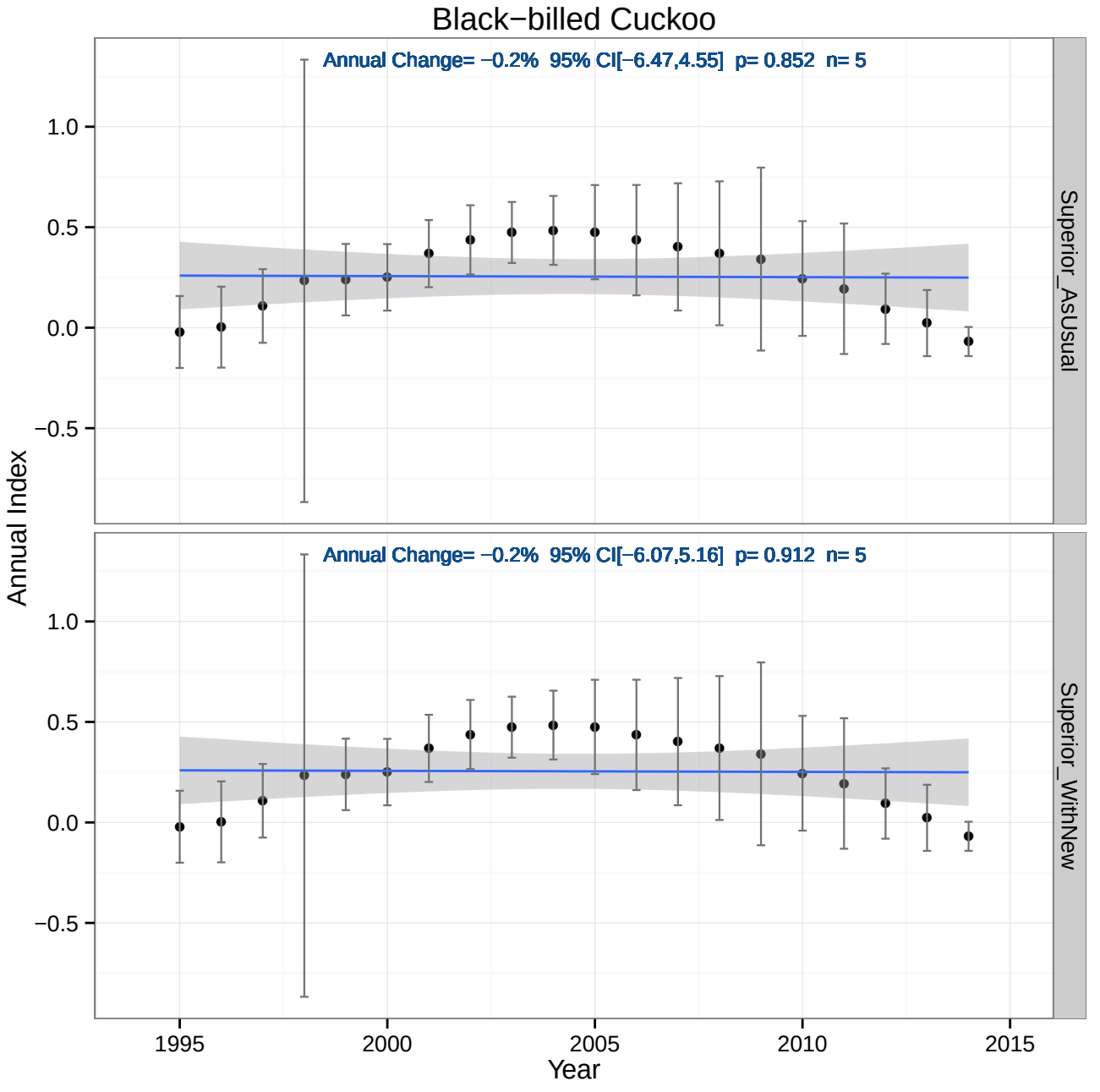

American Crow
Annual Change= −2.23% 95% CI[−3.69,−0.54] p= 0.008 n= 66
Annual Change= −2.03% 95% CI[−3.6,−0.07] p= 0.04 n= 68
Superior_AsUsual
Superior_WithNew
Annual Index
Year
0.2
0.3
0.4
0.5
0.6
1995
2000
2005
2010
2015

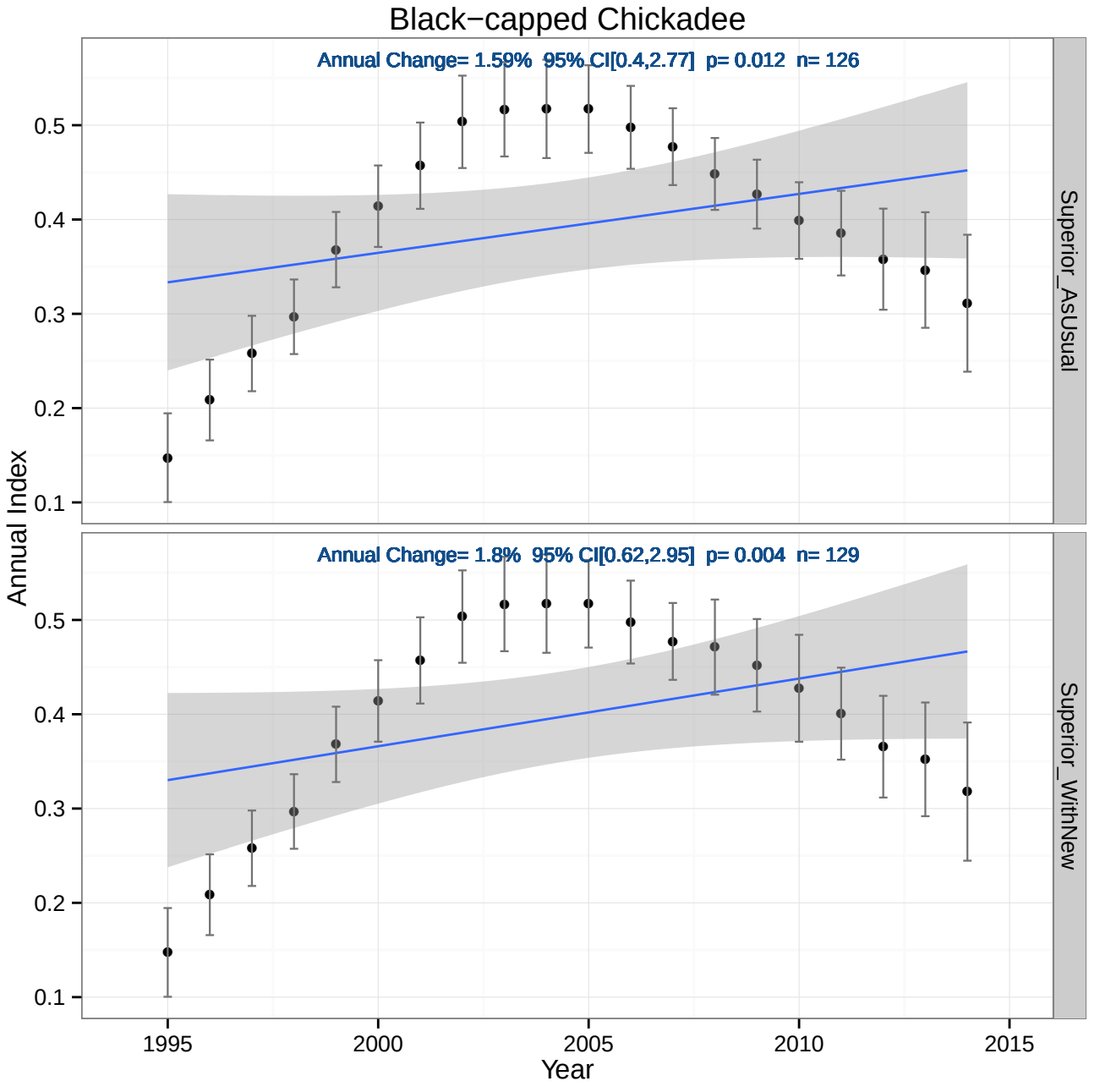

American Goldfinch
Annual Change= 5.45% 95% CI[−1.72,11.97] p= 0.132 n= 9
Annual Change= 5.45% 95% CI[−1.52,12.41] p= 0.16 n= 9
Superior_AsUsual
Superior_WithNew
Annual Index
Year
1.00
0.75
0.50
0.25
0.00
1995
2000
2005
2010
2015

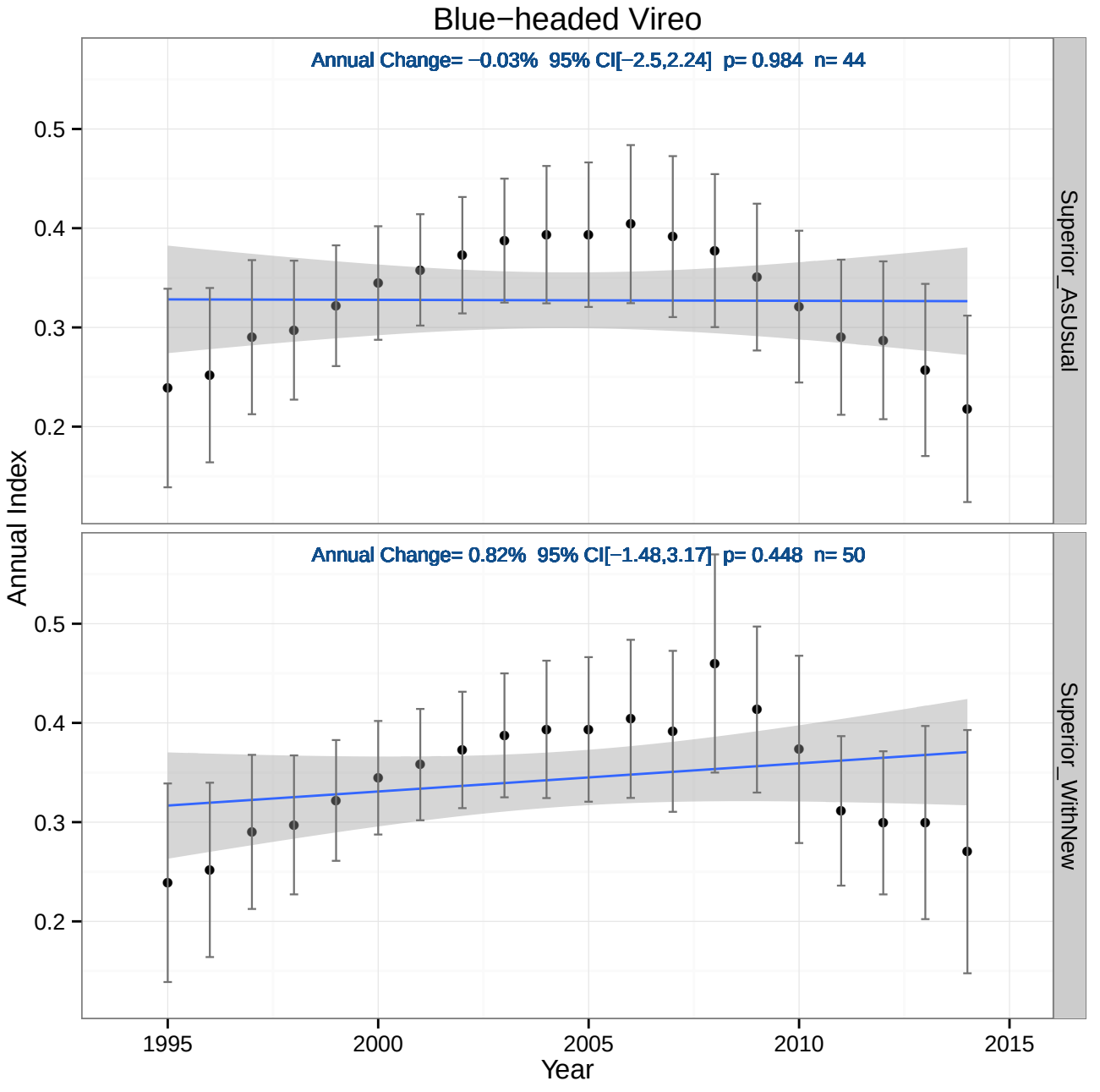

American Redstart
Annual Change= 0.42% 95% CI[−1.19,2.07] p= 0.596 n= 80
Annual Change= 0.46% 95% CI[−1.21,2] p= 0.628 n= 82
Superior_AsUsual
Superior_WithNew
Annual Index
Year
0.7
0.6
0.5
0.4
1995
2000
2005
2010
2015

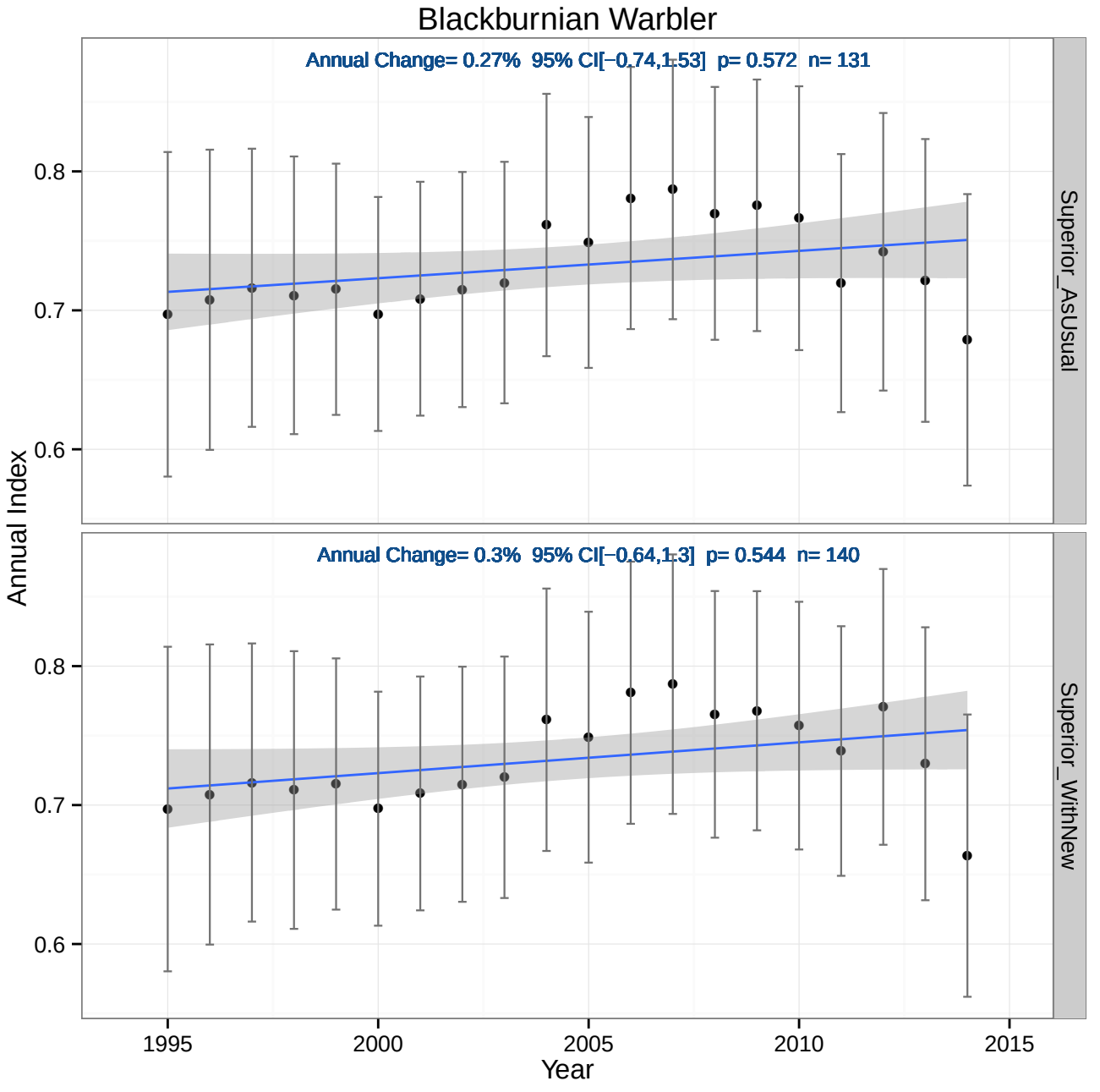

American Robin
Annual Change= 2.32% 95% CI[1.39,3.29] p= 0 n= 145
Annual Change= 2.18% 95% CI[1.22,3.08] p= 0 n= 163
Superior_AsUsual
Superior_WithNew
Annual Index
Year
0.6
0.8
1.0
1.2
1995
2000
2005
2010
2015

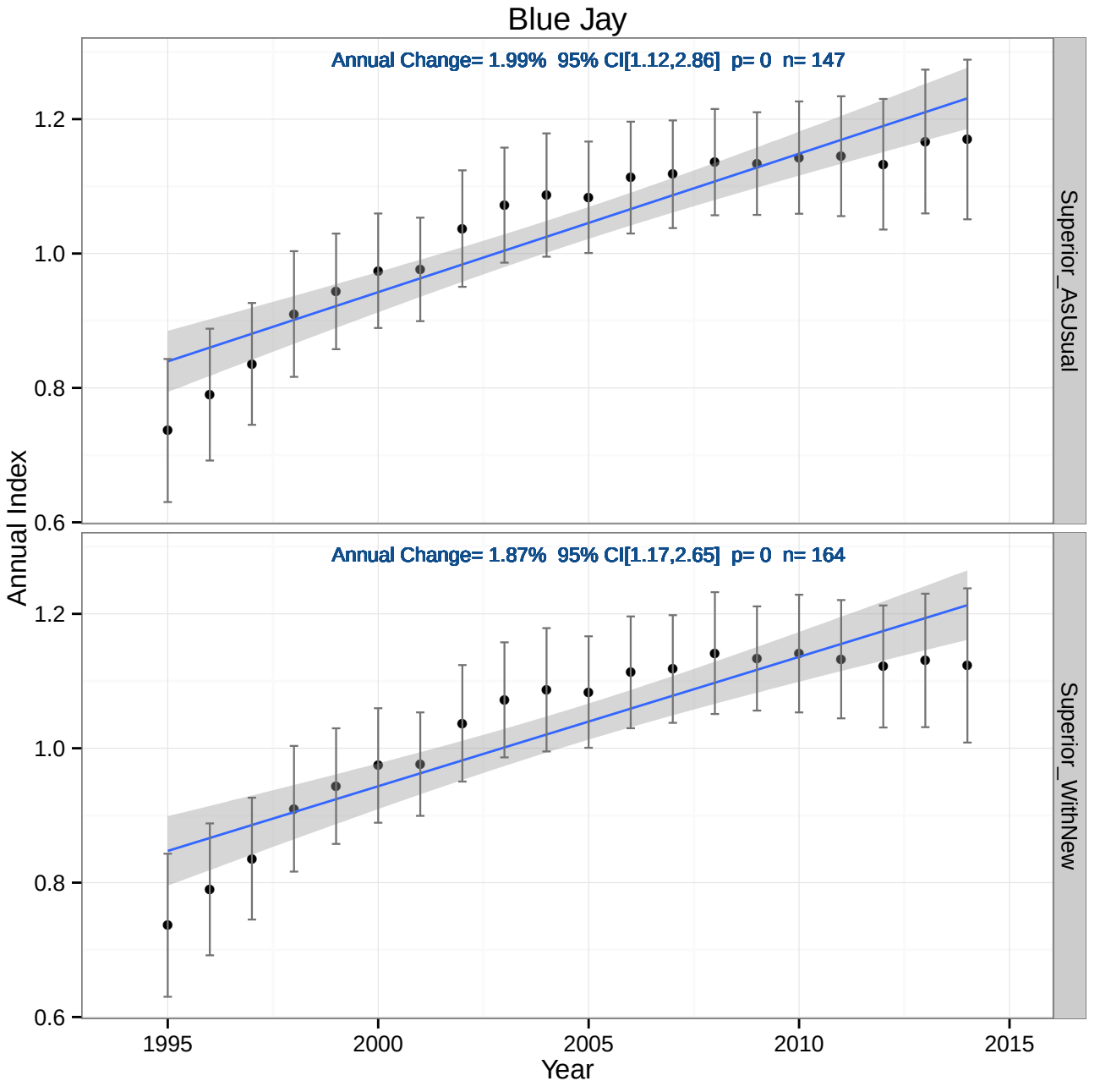

Black−and−white Warbler
Annual Change= 2.99% 95% CI[2.16,3.86] p= 0 n= 134
Annual Change= 2.89% 95% CI[2.08,3.69] p= 0 n= 143
Superior_AsUsual
Superior_WithNew
Annual Index
Year
0.4
0.5
0.6
0.7
0.8
0.9
1995
2000
2005
2010
2015

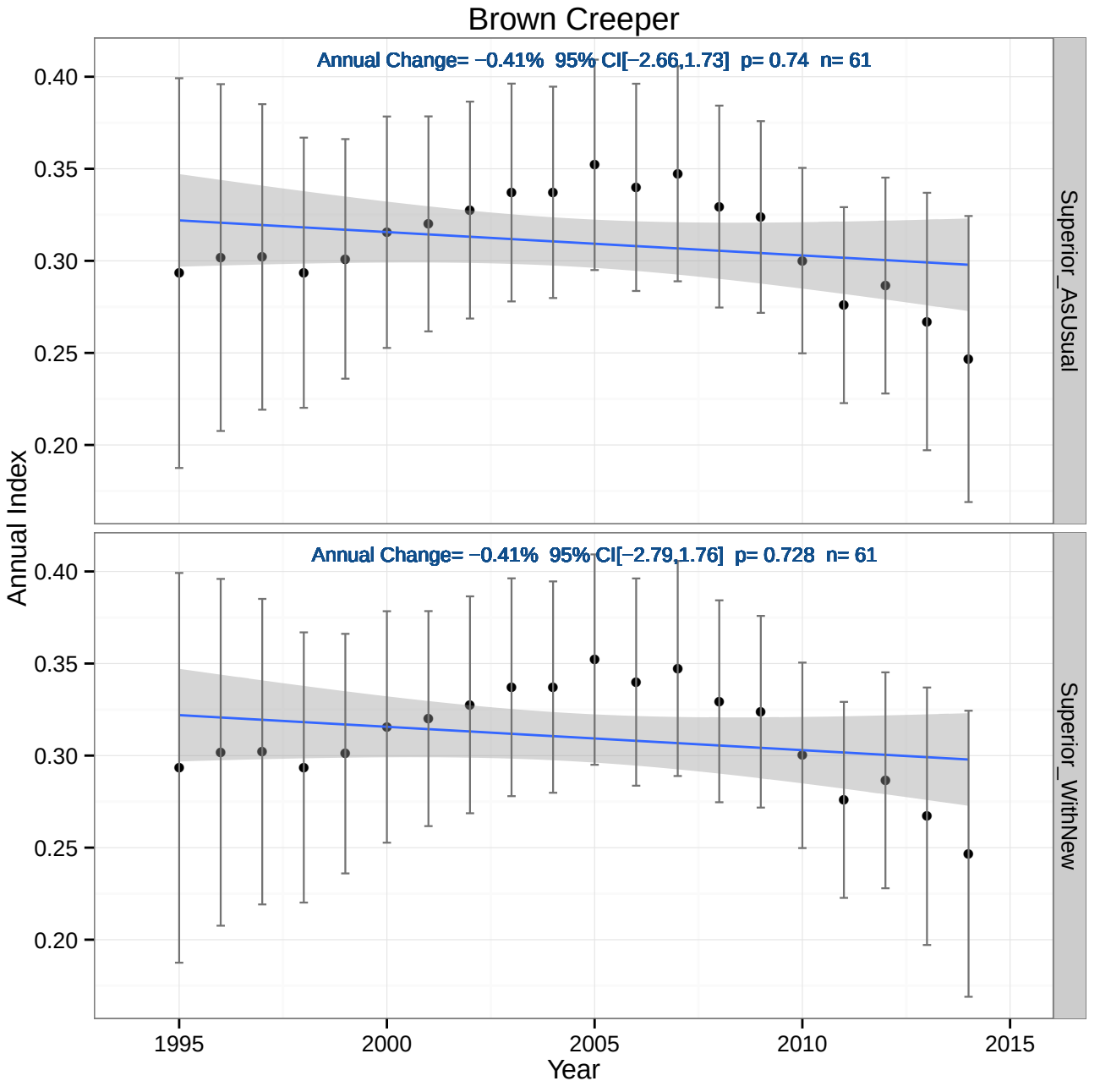

Black−billed Cuckoo
Annual Change= −0.2% 95% CI[−6.47,4.55] p= 0.852 n= 5
Annual Change= −0.2% 95% CI[−6.07,5.16] p= 0.912 n= 5
Superior_AsUsual
Superior_WithNew
Annual Index
1.0
0.5
0.0
−0.5
1995
2000
2005
2010
2015
Year

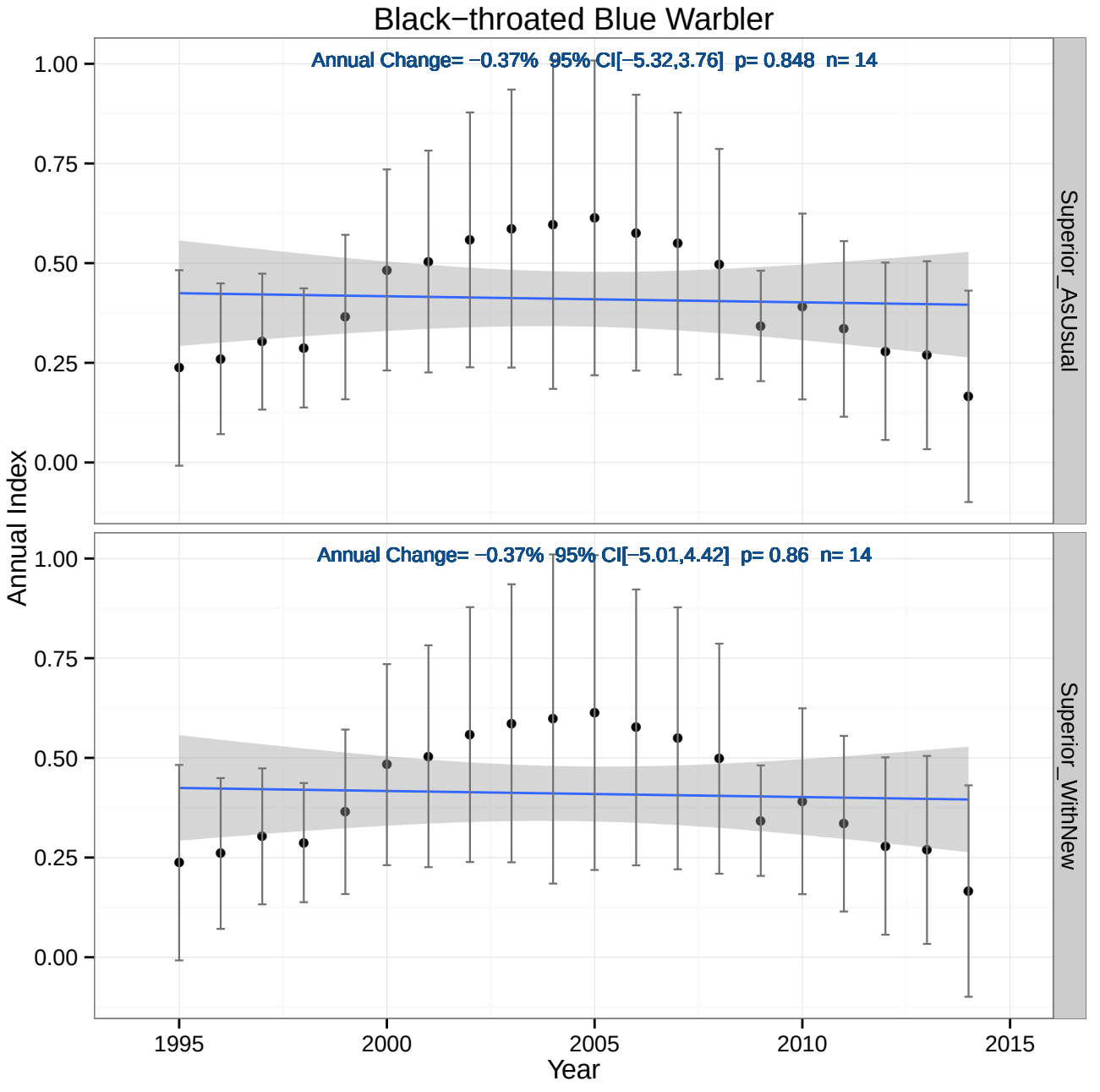

Black−capped Chickadee
Annual Change= 1.59% 95% CI[0.4,2.77] p= 0.012 n= 126
Annual Change= 1.8% 95% CI[0.62,2.95] p= 0.004 n= 129
Superior_AsUsual
Superior_WithNew
Annual Index
0.1
0.2
0.3
0.4
0.5
1995
2000
2005
2010
2015
Year

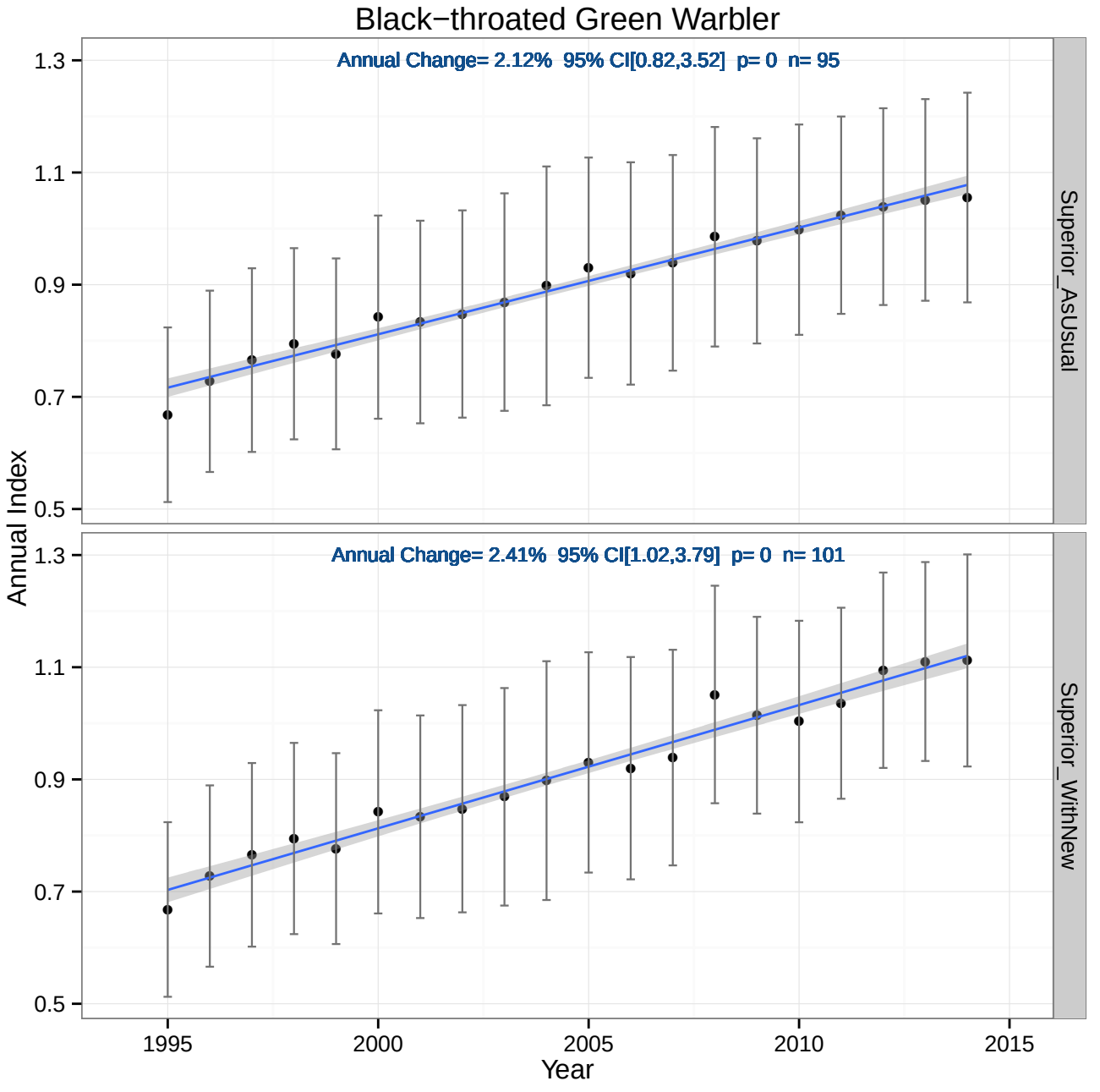

Blue−headed Vireo
Annual Change= −0.03% 95% CI[−2.5,2.24] p= 0.984 n= 44
Annual Change= 0.82% 95% CI[−1.48,3.17] p= 0.448 n= 50
Superior_AsUsual
Superior_WithNew
Annual Index
0.5
0.4
0.3
0.2
1995
2000
2005
2010
2015
Year

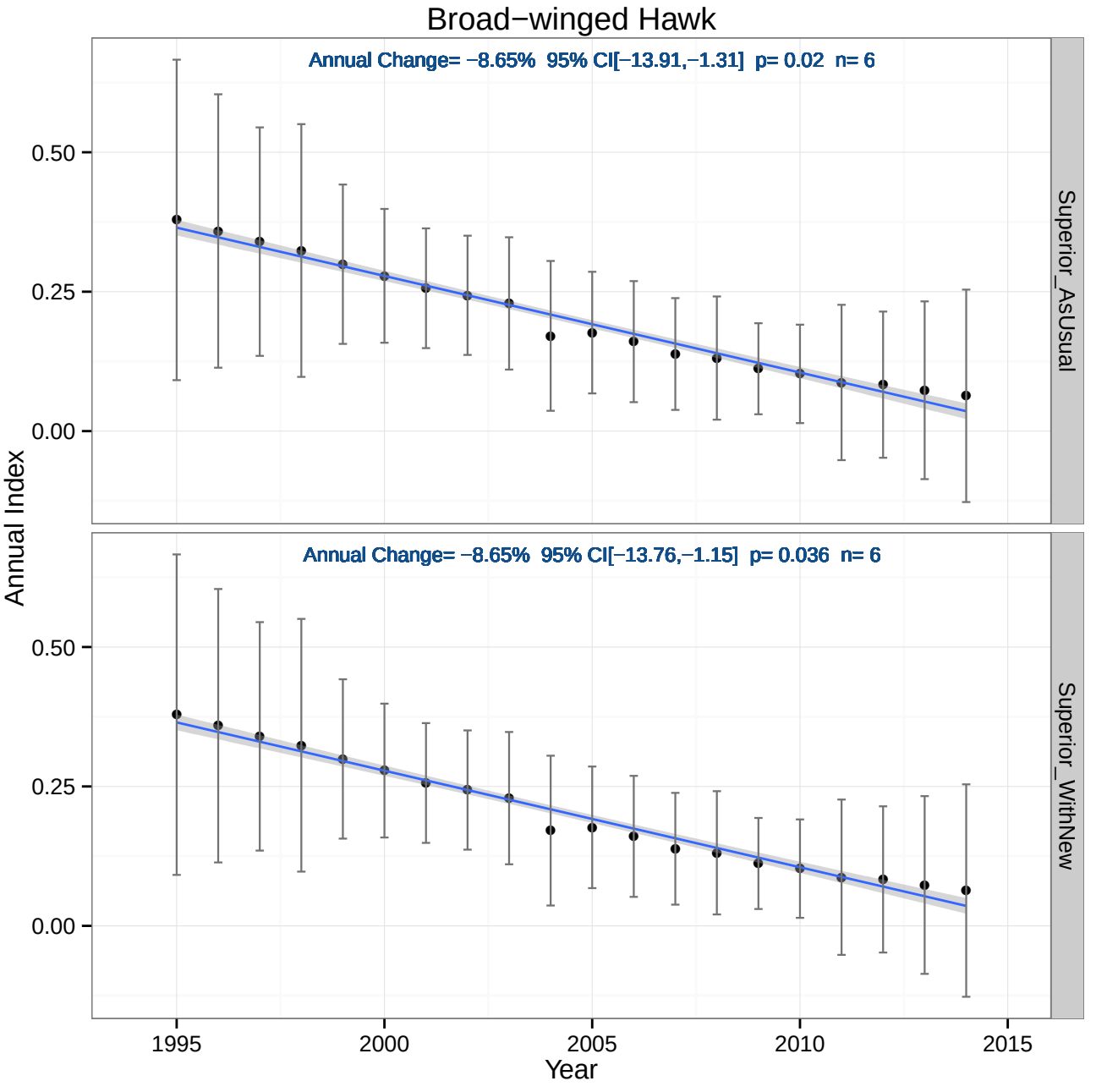

Blackburnian Warbler
Annual Change= 0.27% 95% CI[−0.74,1.53] p= 0.572 n= 131
Annual Change= 0.3% 95% CI[−0.64,1.3] p= 0.544 n= 140
Superior_AsUsual
Superior_WithNew
Annual Index
0.6
0.7
0.8
1995
2000
2005
2010
2015
Year

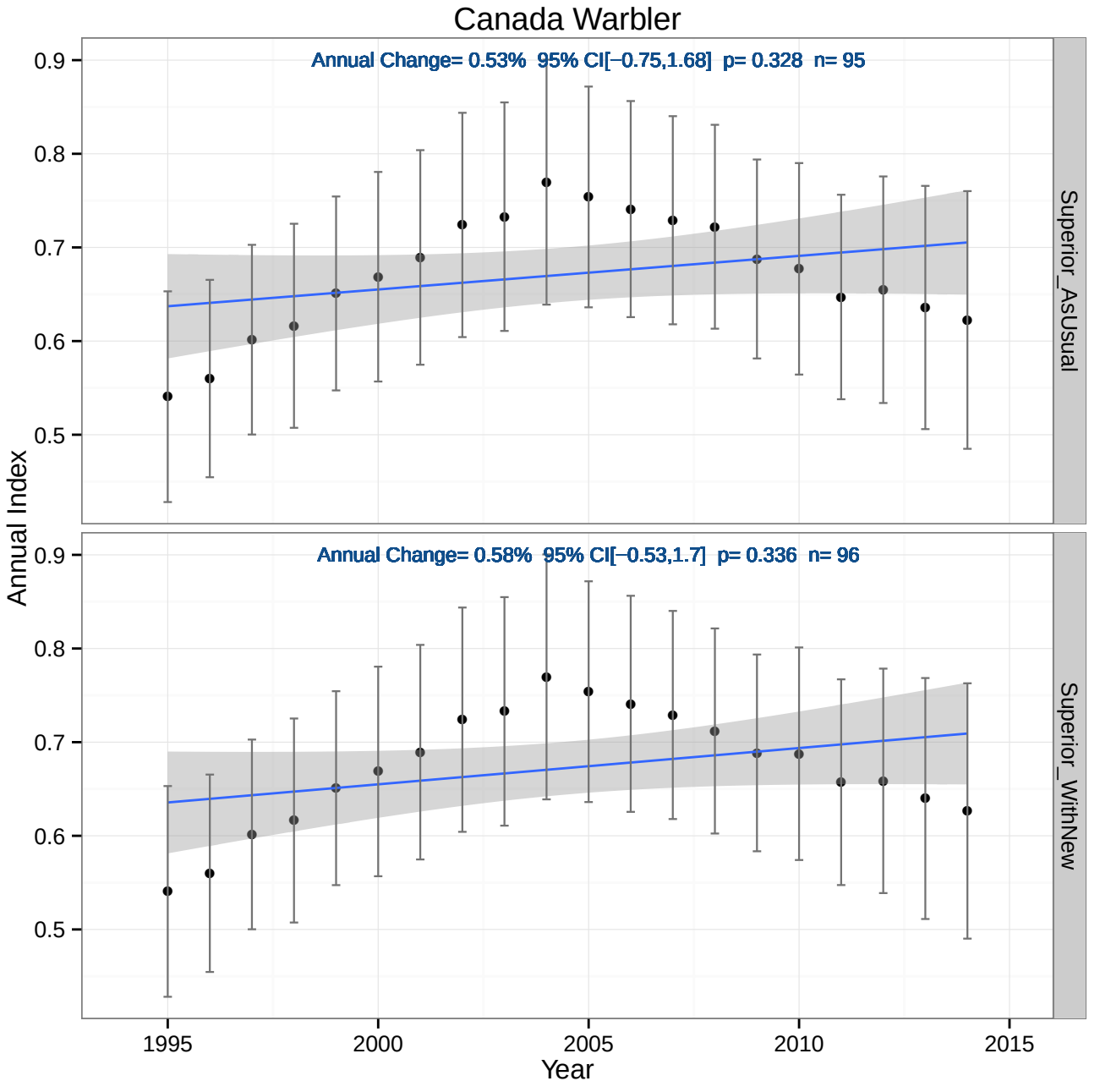

Blue Jay
Annual Change= 1.99% 95% CI[1.12,2.86] p= 0 n= 147
Annual Change= 1.87% 95% CI[1.17,2.65] p= 0 n= 164
Superior_AsUsual
Superior_WithNew
Annual Index
Year
0.6
0.8
1.0
1.2
1995
2000
2005
2010
2015

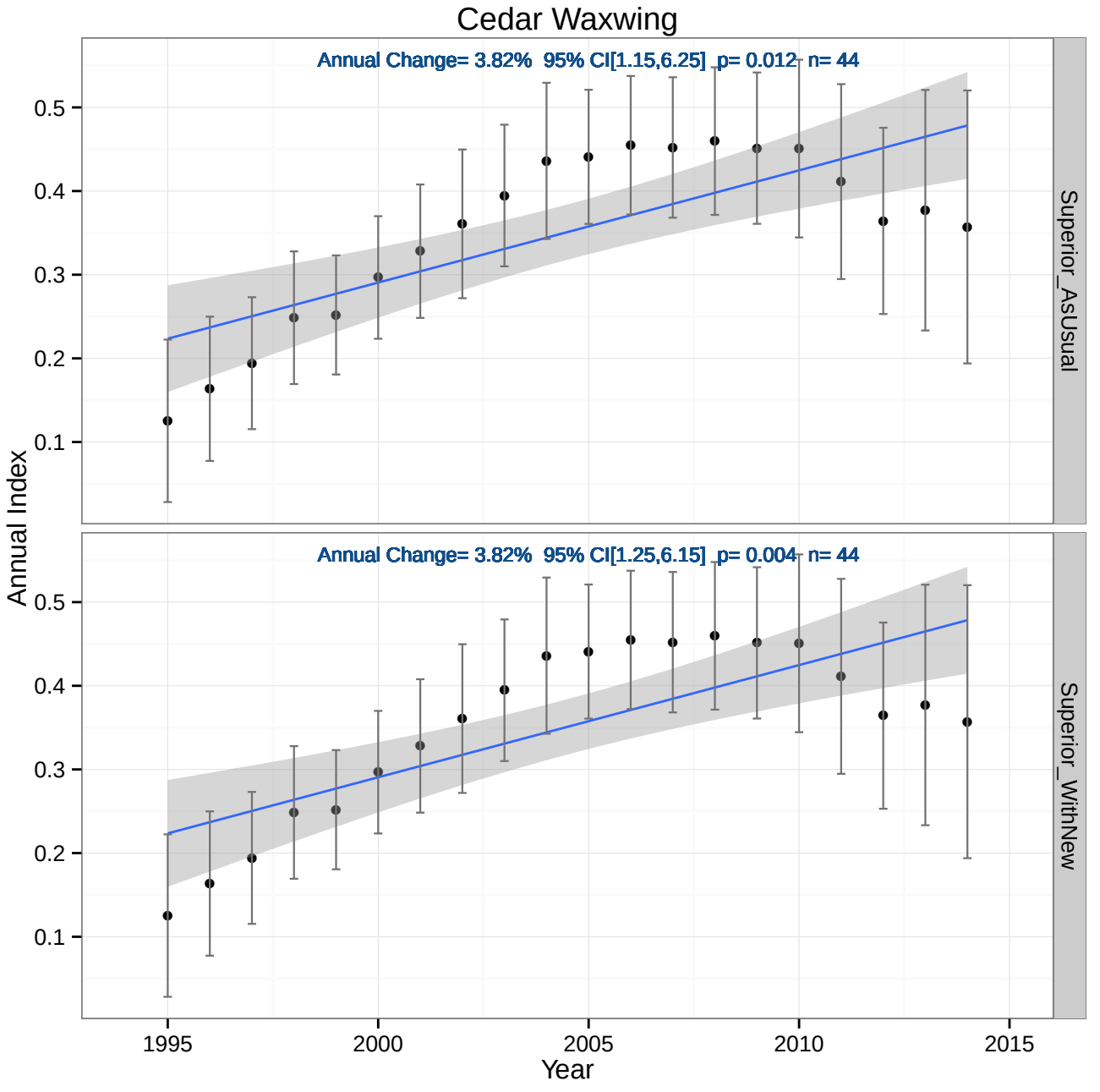

Brown Creeper
Annual Change= −0.41% 95% CI[−2.66,1.73] p= 0.74 n= 61
Annual Change= −0.41% 95% CI[−2.79,1.76] p= 0.728 n= 61
Superior_AsUsual
Superior_WithNew
Annual Index
0.40
0.35
0.30
0.25
0.20
1995
2000
2005
2010
2015
Year

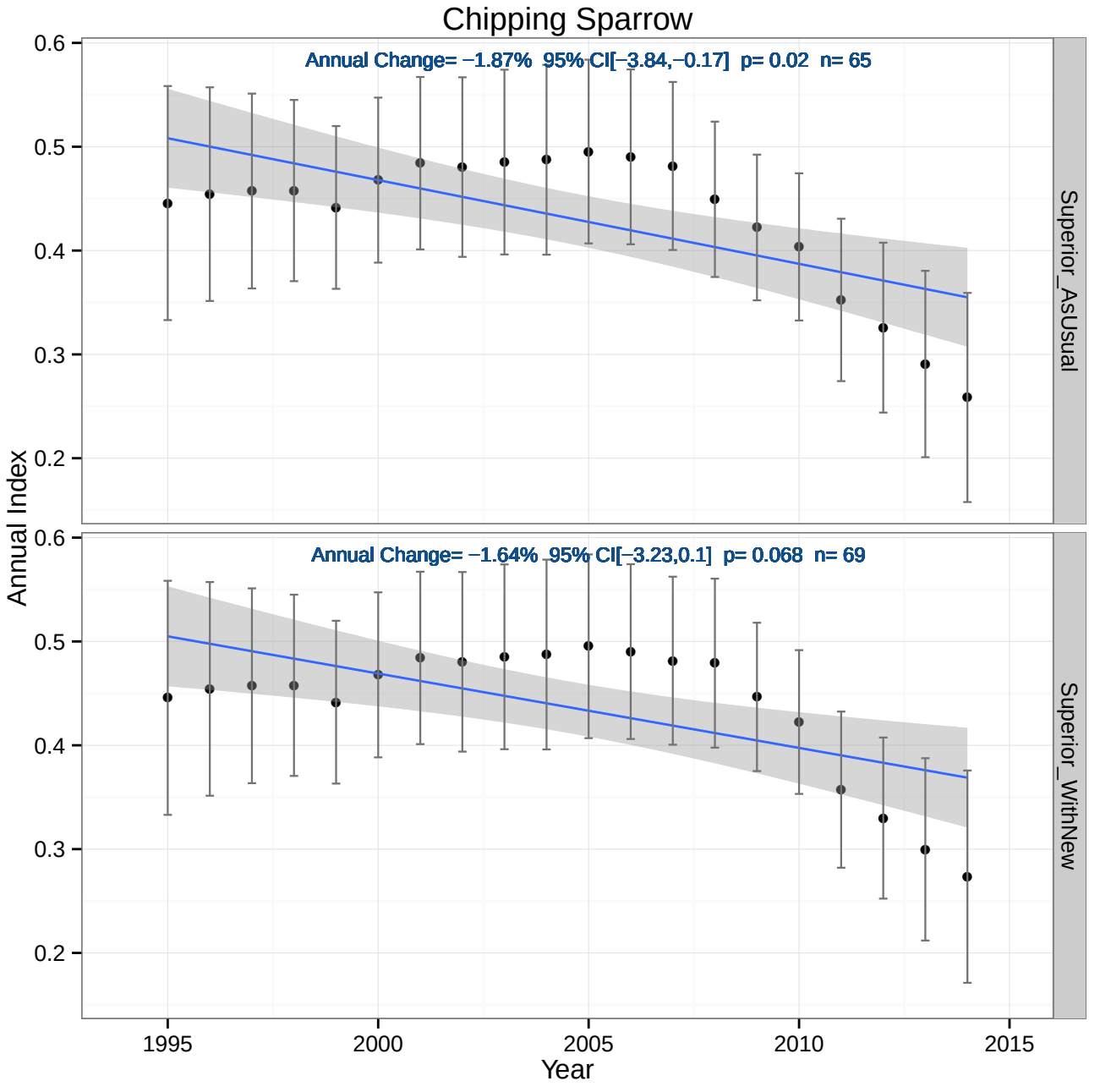

Black−throated Blue Warbler
Annual Change= −0.37% 95% CI[−5.32,3.76] p= 0.848 n= 14
Annual Change= −0.37% 95% CI[−5.01,4.42] p= 0.86 n= 14
Superior_AsUsual
Superior_WithNew
Annual Index
Year
1.00
0.75
0.50
0.25
0.00
1995
2000
2005
2010
2015

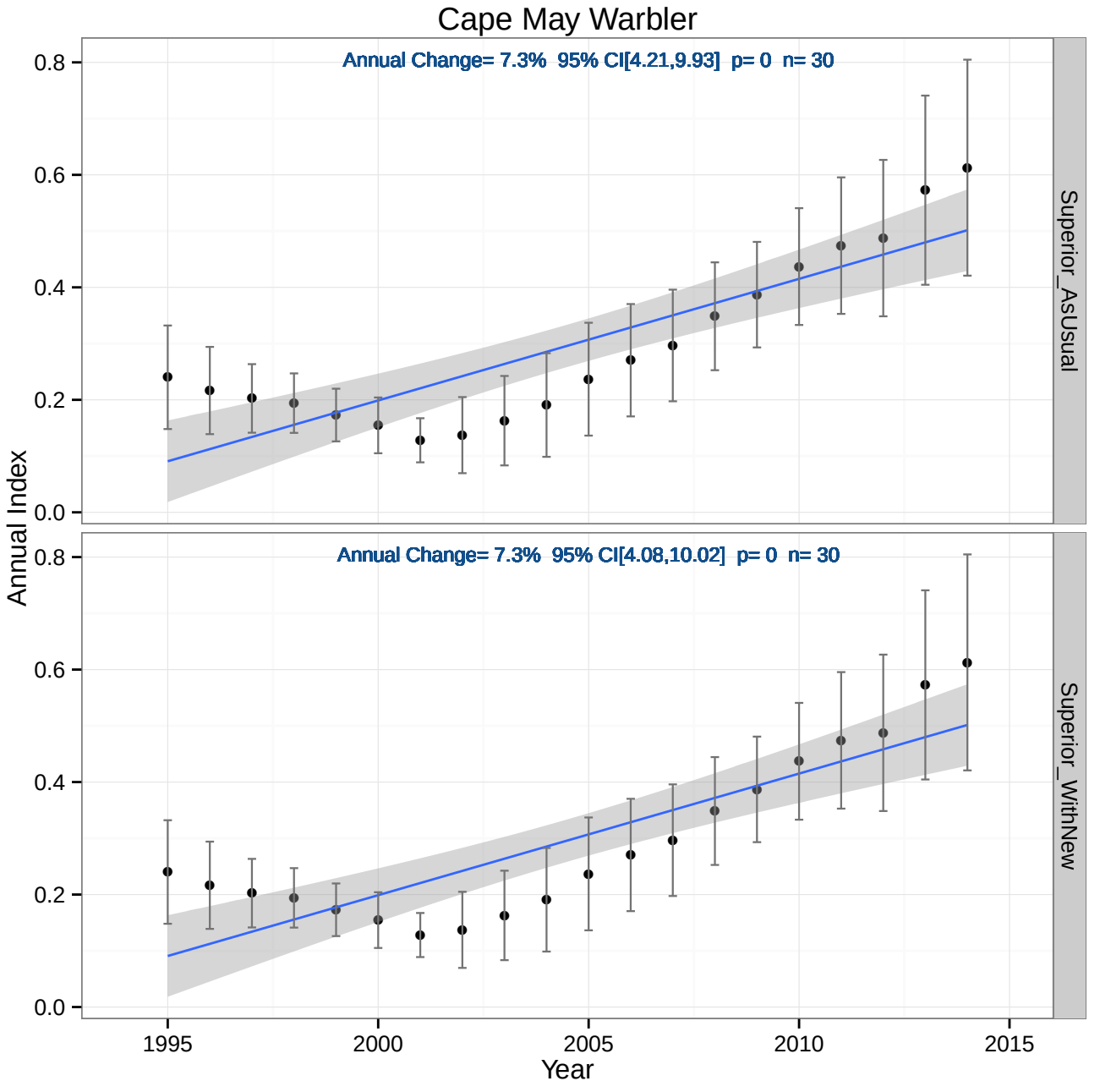

Black−throated Green Warbler
Annual Change= 2.12% 95% CI[0.82,3.52] p= 0 n= 95
Annual Change= 2.41% 95% CI[1.02,3.79] p= 0 n= 101
Superior_AsUsual
Superior_WithNew
Annual Index
Year
1.3
1.1
0.9
0.7
0.5
1995
2000
2005
2010
2015

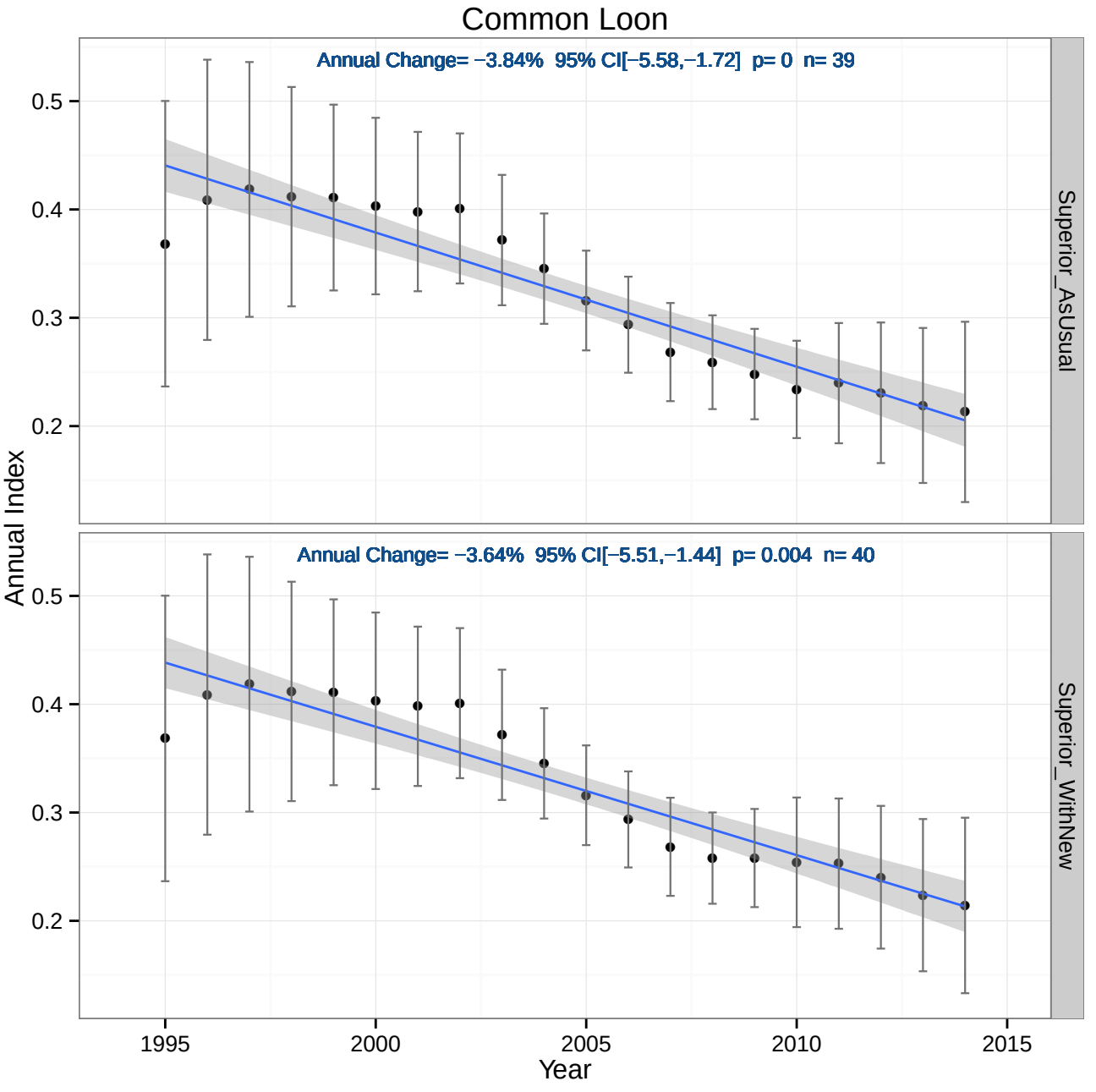

Broad−winged Hawk
Annual Change= −8.65% 95% CI[−13.91,−1.31] p= 0.02 n= 6
Annual Change= −8.65% 95% CI[−13.76,−1.15] p= 0.036 n= 6
Superior_AsUsual
Superior_WithNew
Annual Index
0.00
0.25
0.50
1995
2000
2005
2010
2015
Year

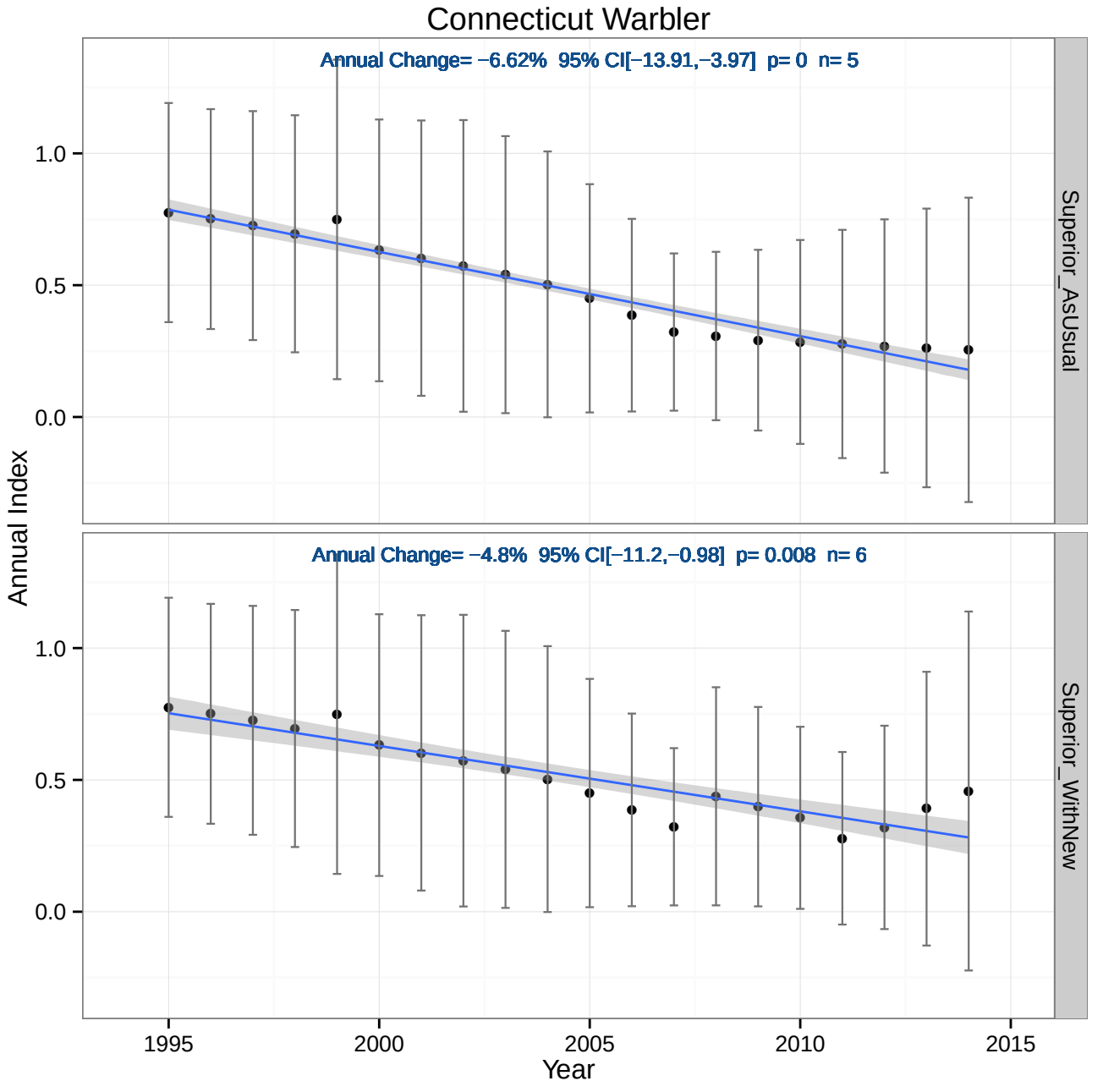

Canada Warbler
Annual Change= 0.53% 95% CI[−0.75,1.68] p= 0.328 n= 95
Annual Change= 0.58% 95% CI[−0.53,1.7] p= 0.336 n= 96
Superior_AsUsual
Superior_WithNew
Annual Index
Year
0.9
0.8
0.7
0.6
0.5
1995
2000
2005
2010
2015

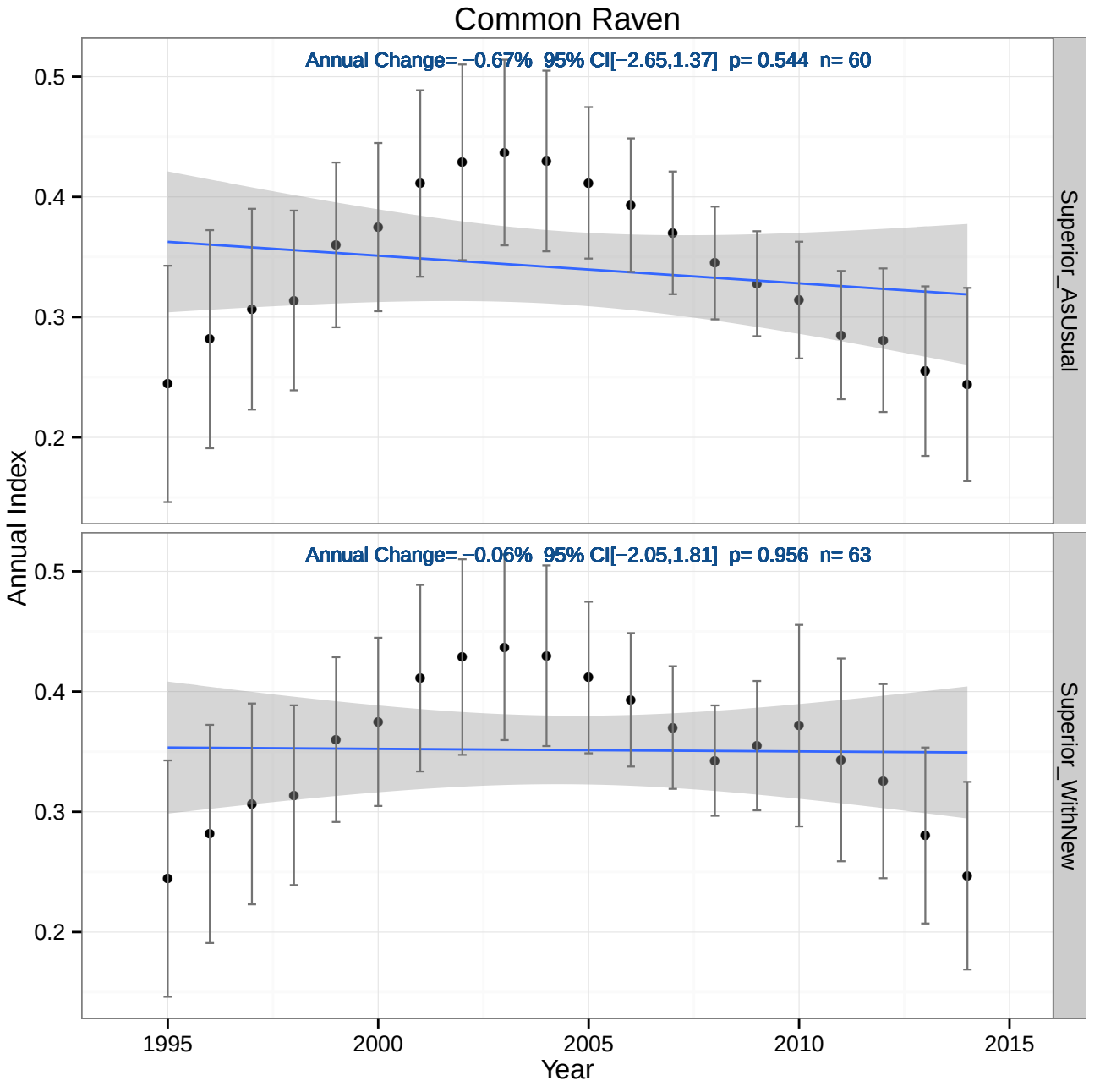

Cedar Waxwing
Annual Change= 3.82% 95% CI[1.15,6.25] p= 0.012 n= 44
Annual Change= 3.82% 95% CI[1.25,6.15] p= 0.004 n= 44
Superior_AsUsual
Superior_WithNew
Annual Index
0.1
0.2
0.3
0.4
0.5
1995
2000
2005
2010
2015
Year

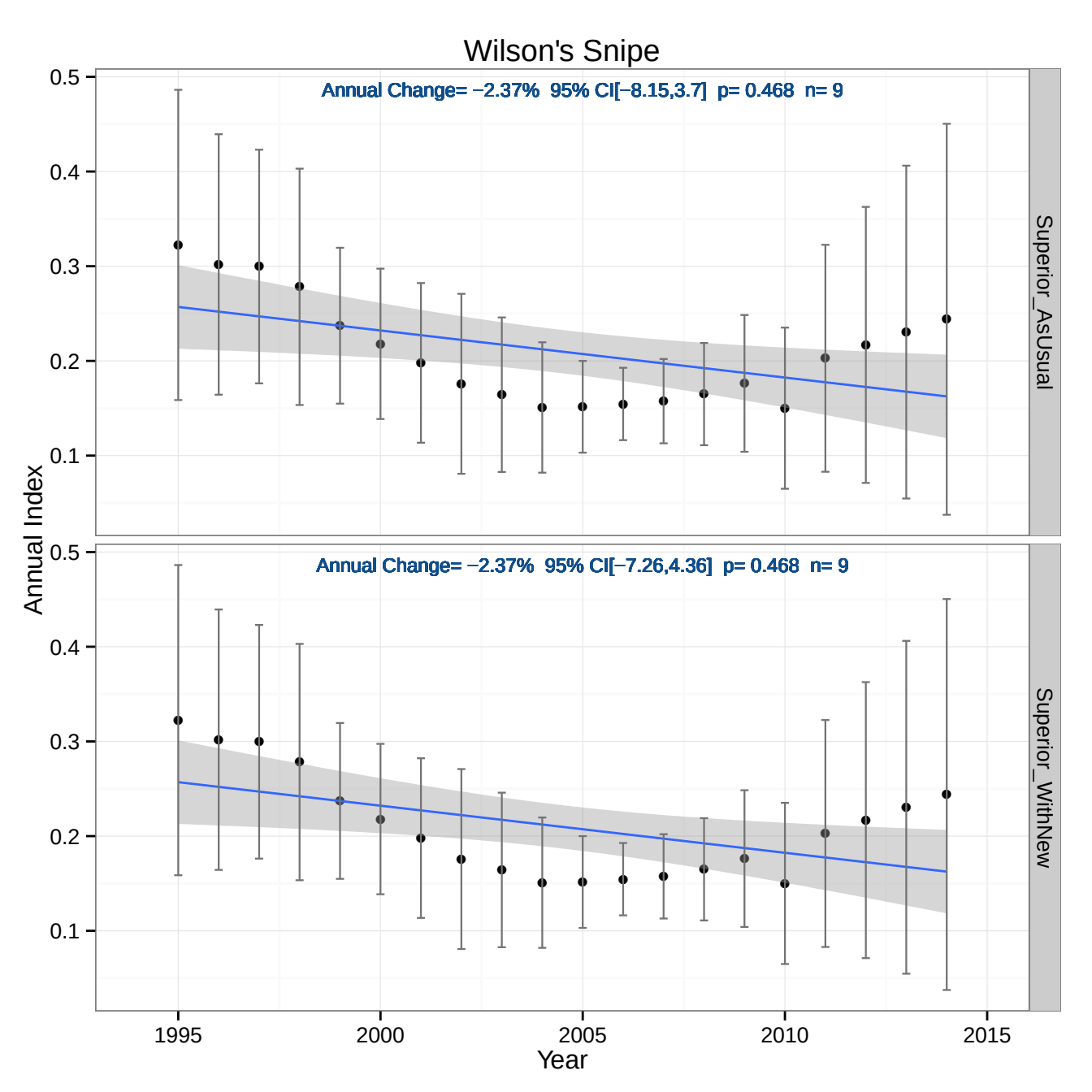

Chipping Sparrow
Annual Change= −1.87% 95% CI[−3.84,−0.17] p= 0.02 n= 65
Annual Change= −1.64% 95% CI[−3.23,0.1] p= 0.068 n= 69
Superior_AsUsual
Superior_WithNew
Annual Index
Year
0.6
0.5
0.4
0.3
0.2
1995
2000
2005
2010
2015

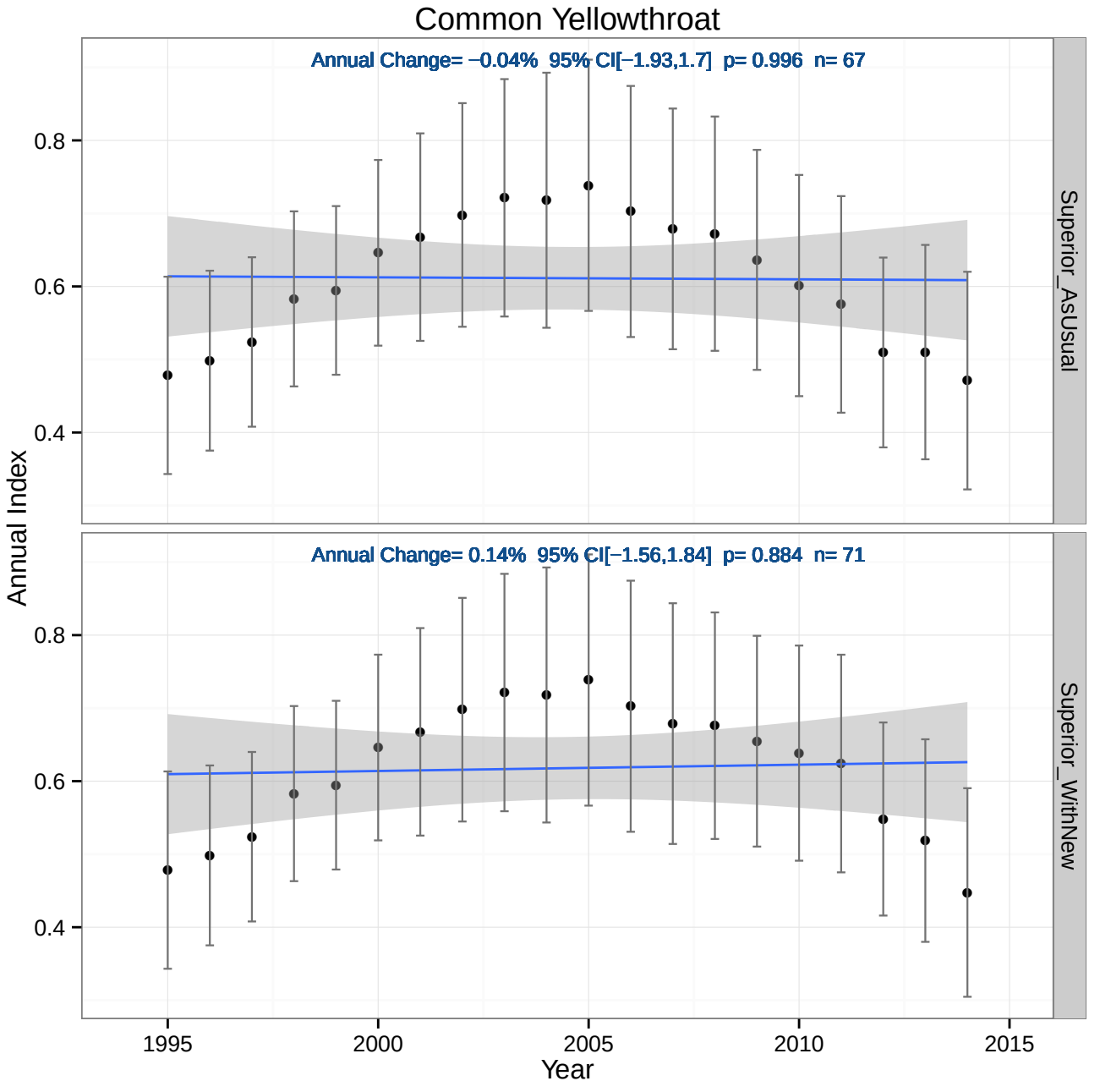

Cape May Warbler
Annual Change= 7.3% 95% CI[4.21,9.93] p= 0 n= 30
Annual Change= 7.3% 95% CI[4.08,10.02] p= 0 n= 30
Superior_AsUsual
Superior_WithNew
Annual Index
Year
0.0
0.2
0.4
0.6
0.8
1995
2000
2005
2010
2015

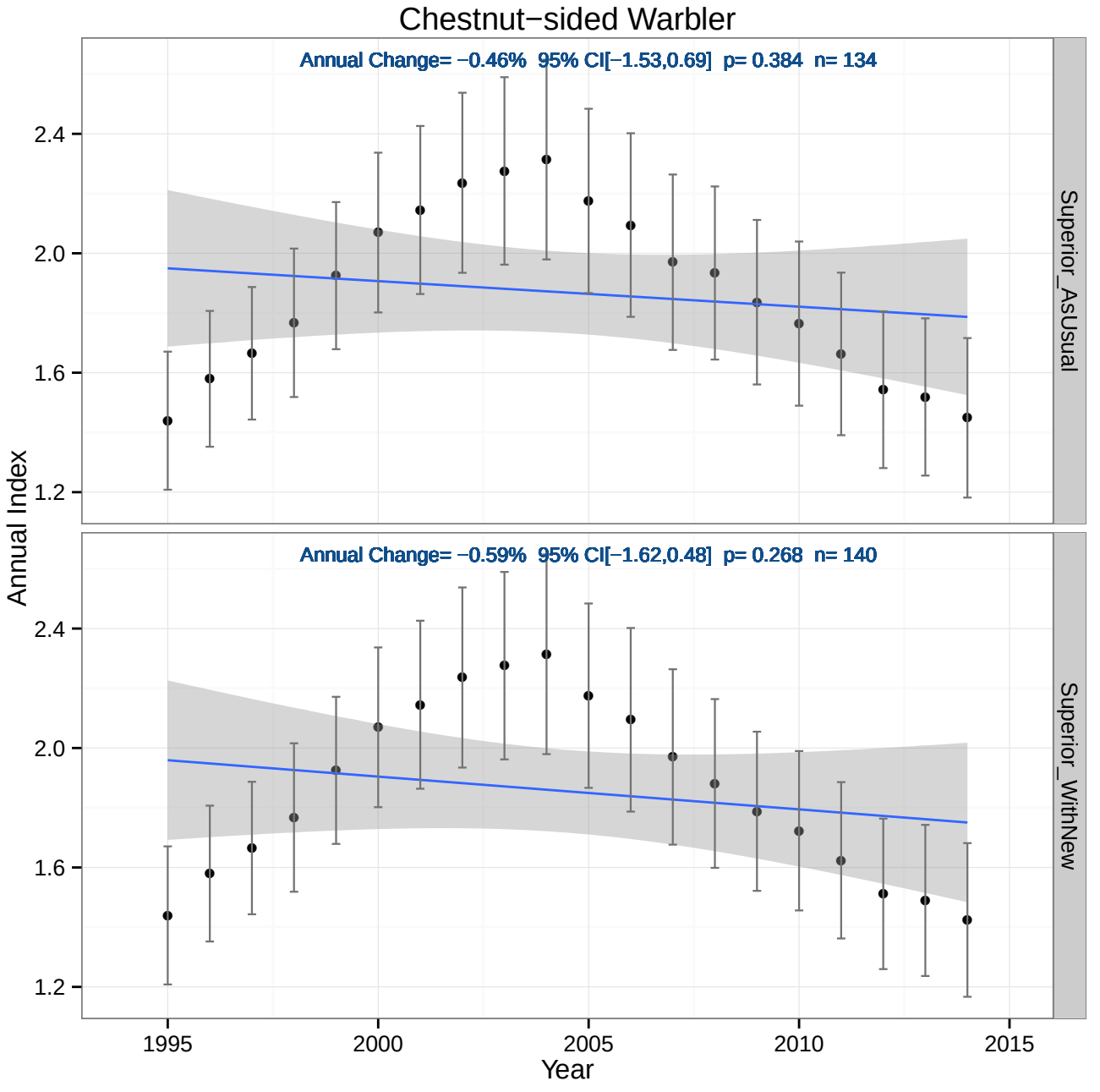

Common Loon
Annual Change= −3.84% 95% CI[−5.58,−1.72] p= 0 n= 39
Annual Change= −3.64% 95% CI[−5.51,−1.44] p= 0.004 n= 40
Superior_AsUsual
Superior_WithNew
Annual Index
0.5
0.4
0.3
0.2
1995
2000
2005
2010
2015
Year

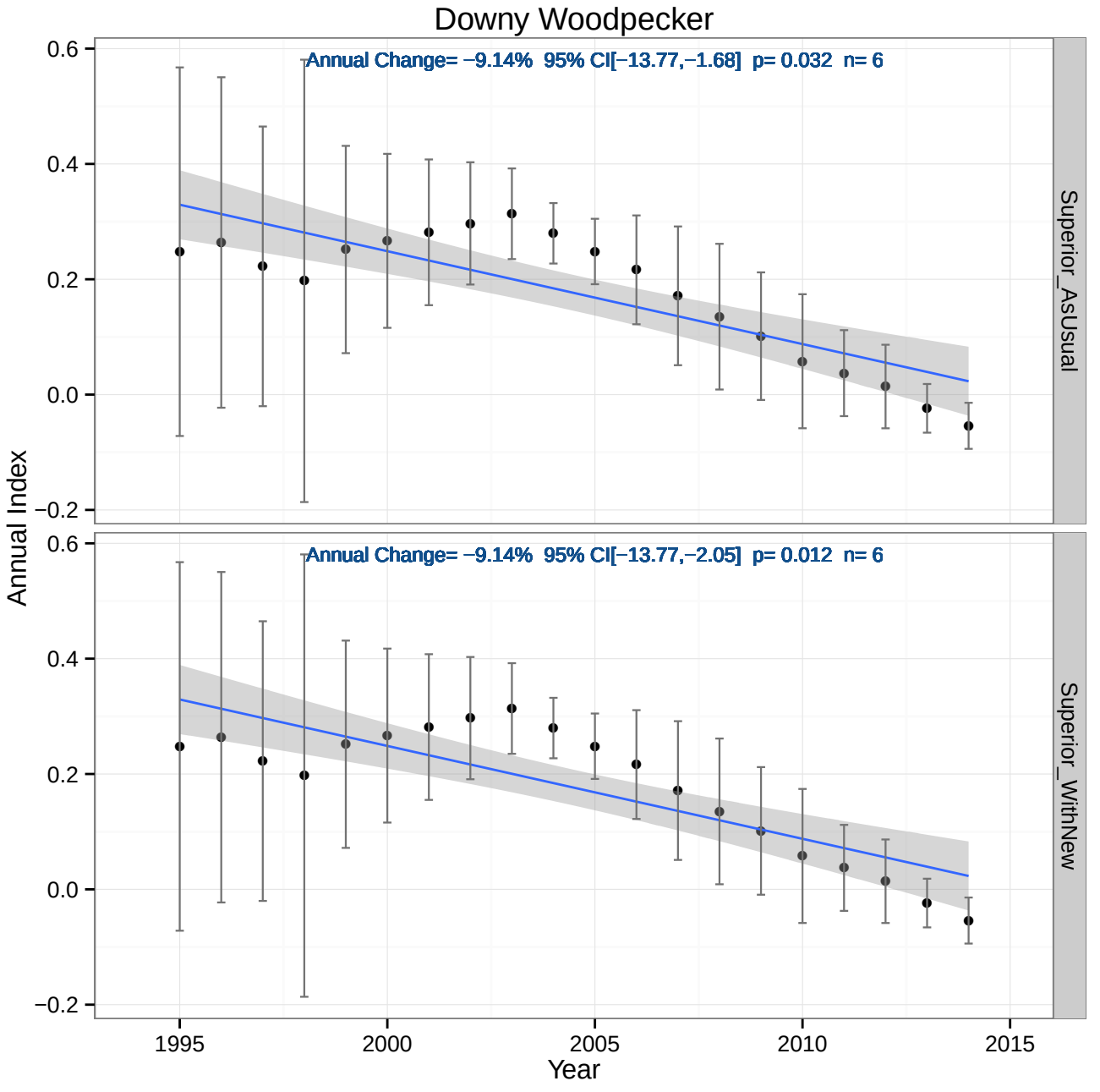

Connecticut Warbler
Annual Change= −6.62% 95% CI[−13.91,−3.97] p= 0 n= 5
Annual Change= −4.8% 95% CI[−11.2,−0.98] p= 0.008 n= 6
Superior_AsUsual
Superior_WithNew
Annual Index
1.0
0.5
0.0
1995
2000
2005
2010
2015
Year

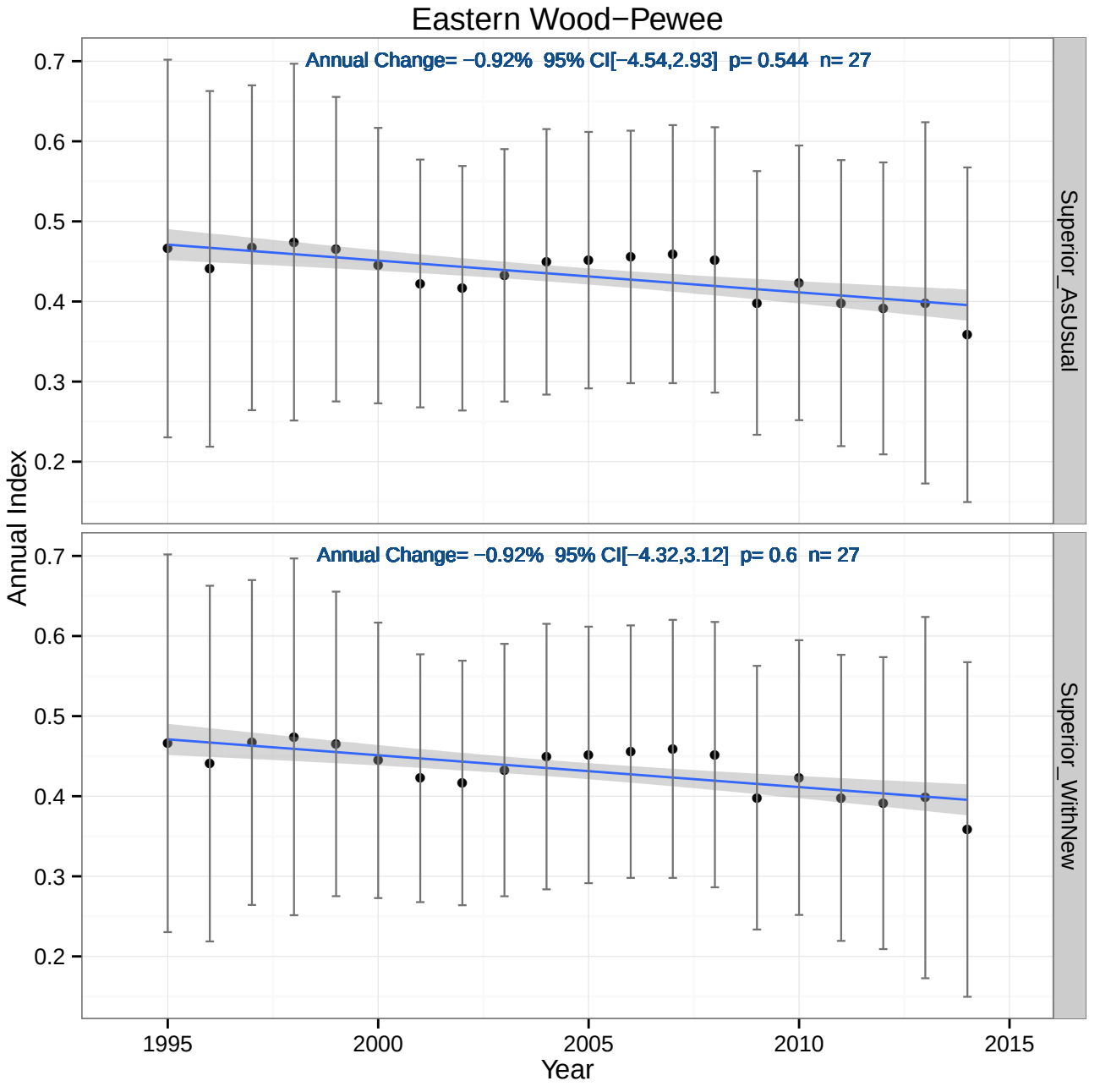

Common Raven
Annual Change= −0.67% 95% CI[−2.65,1.37] p= 0.544 n= 60
Annual Change= −0.06% 95% CI[−2.05,1.81] p= 0.956 n= 63
Superior_AsUsual
Superior_WithNew
Annual Index
0.5
0.4
0.3
0.2
1995
2000
2005
2010
2015
Year

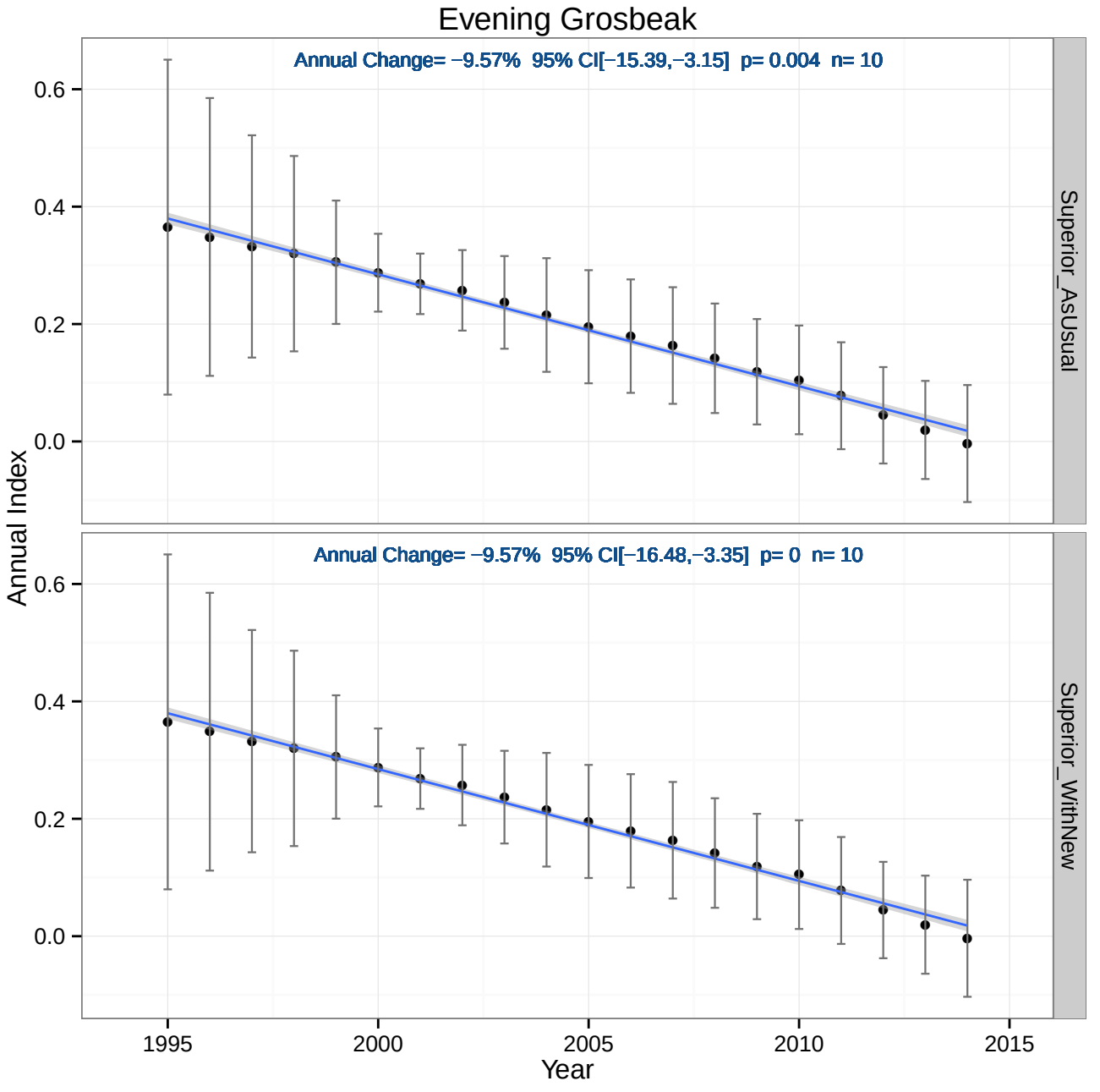

Wilson's Snipe
Annual Change= −2.37% 95% CI[−8.15,3.7] p= 0.468 n= 9
Annual Change= −2.37% 95% CI[−7.26,4.36] p= 0.468 n= 9
Superior_AsUsual
Superior_WithNew
Annual Index
Year
0.5
0.4
0.3
0.2
0.1
1995
2000
2005
2010
2015

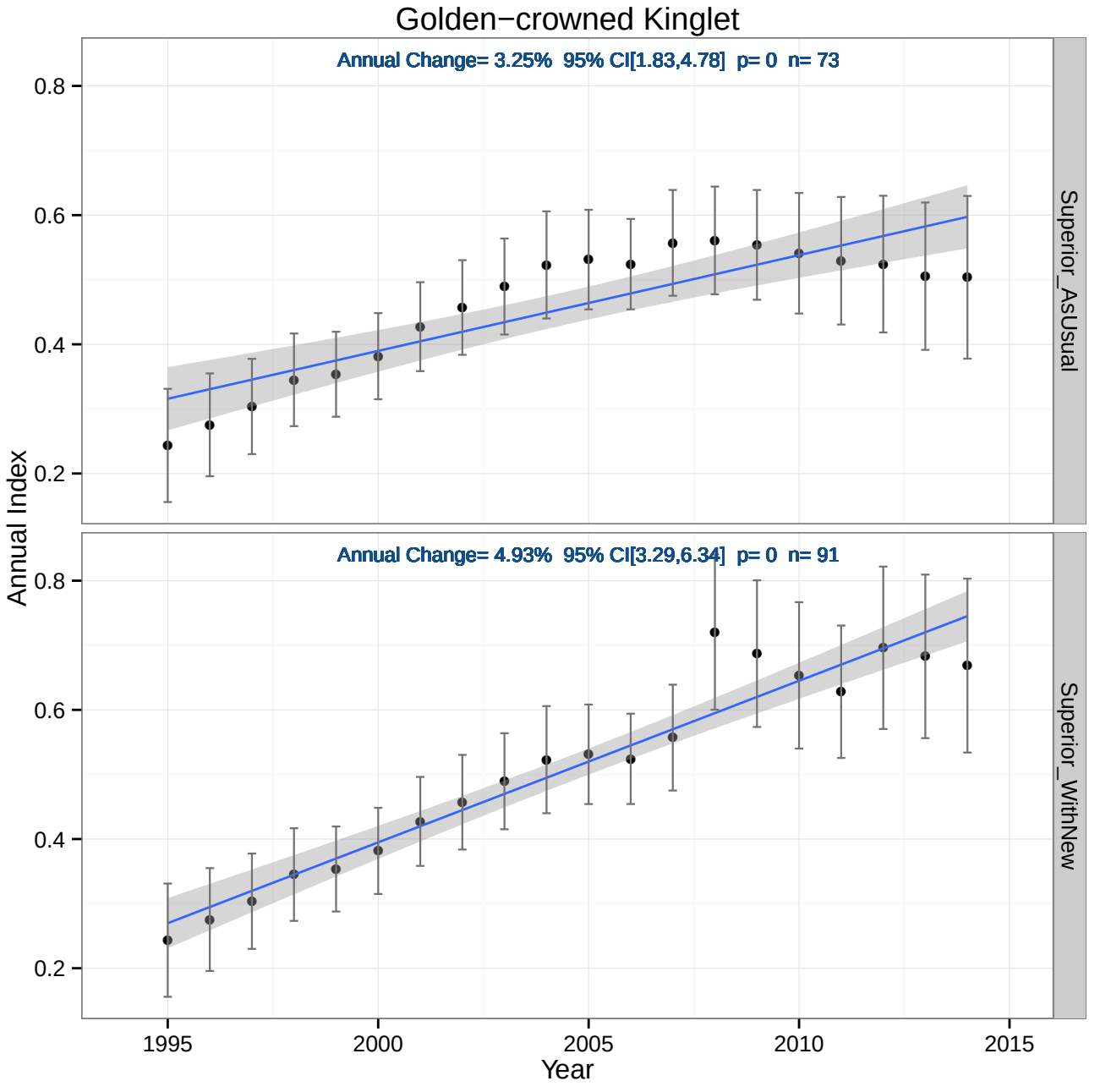

Common Yellowthroat
Annual Change= −0.04% 95% CI[−1.93,1.7] p= 0.996 n= 67
Annual Change= 0.14% 95% CI[−1.56,1.84] p= 0.884 n= 71
Superior_AsUsual
Superior_WithNew
Annual Index
0.4
0.6
0.8
1995
2000
2005
2010
2015
Year

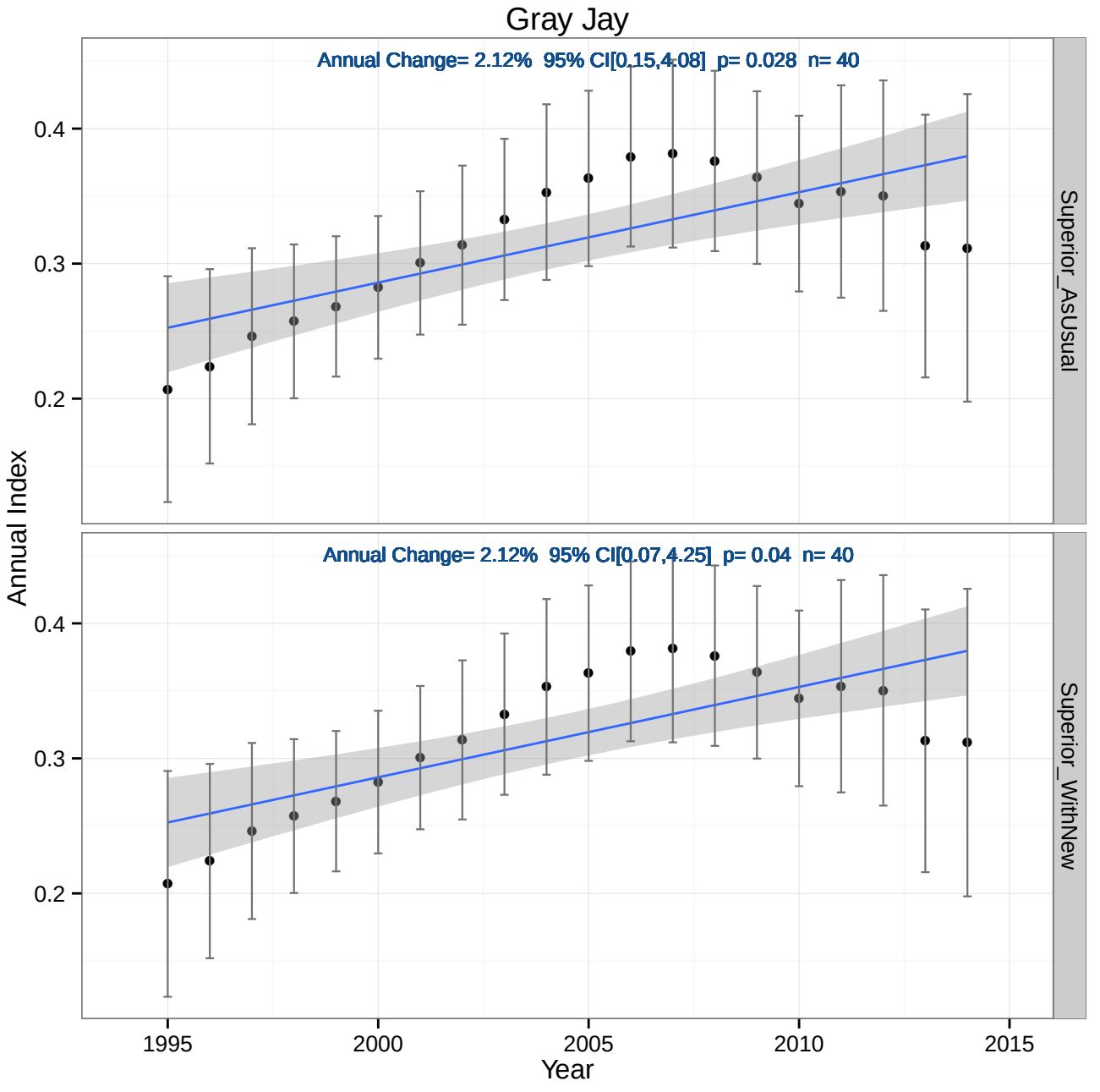

Chestnut−sided Warbler
Annual Change= −0.46% 95% CI[−1.53,0.69] p= 0.384 n= 134
Annual Change= −0.59% 95% CI[−1.62,0.48] p= 0.268 n= 140
Superior_AsUsual
Superior_WithNew
Annual Index
2.4
2.0
1.6
1.2
1995
2000
2005
2010
2015
Year

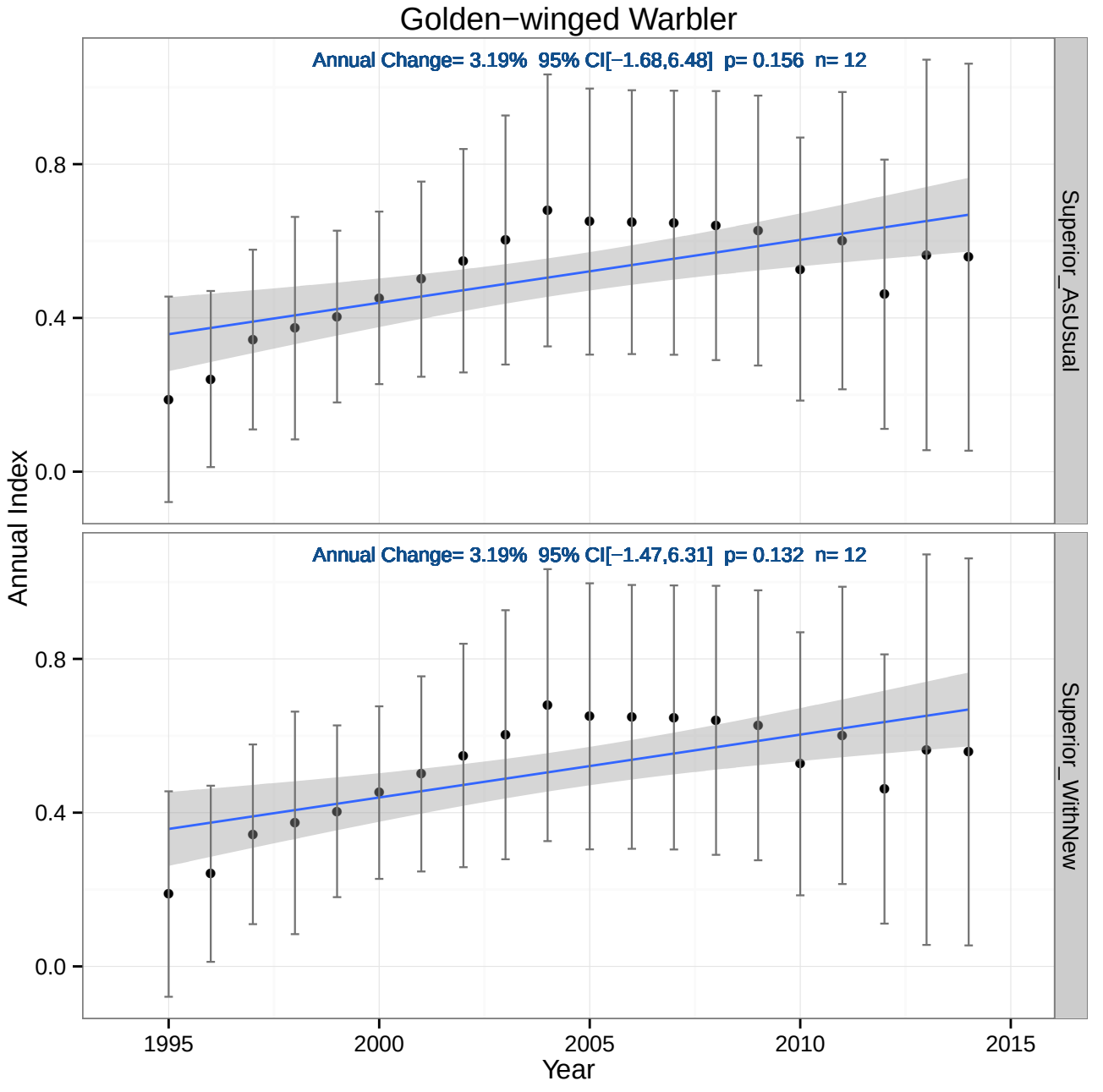

Downy Woodpecker
Annual Change= −9.14% 95% CI[−13.77,−1.68] p= 0.032 n= 6
Annual Change= −9.14% 95% CI[−13.77,−2.05] p= 0.012 n= 6
Superior_AsUsual
Superior_WithNew
Annual Index
Year
0.6
0.4
0.2
0.0
−0.2
1995
2000
2005
2010
2015

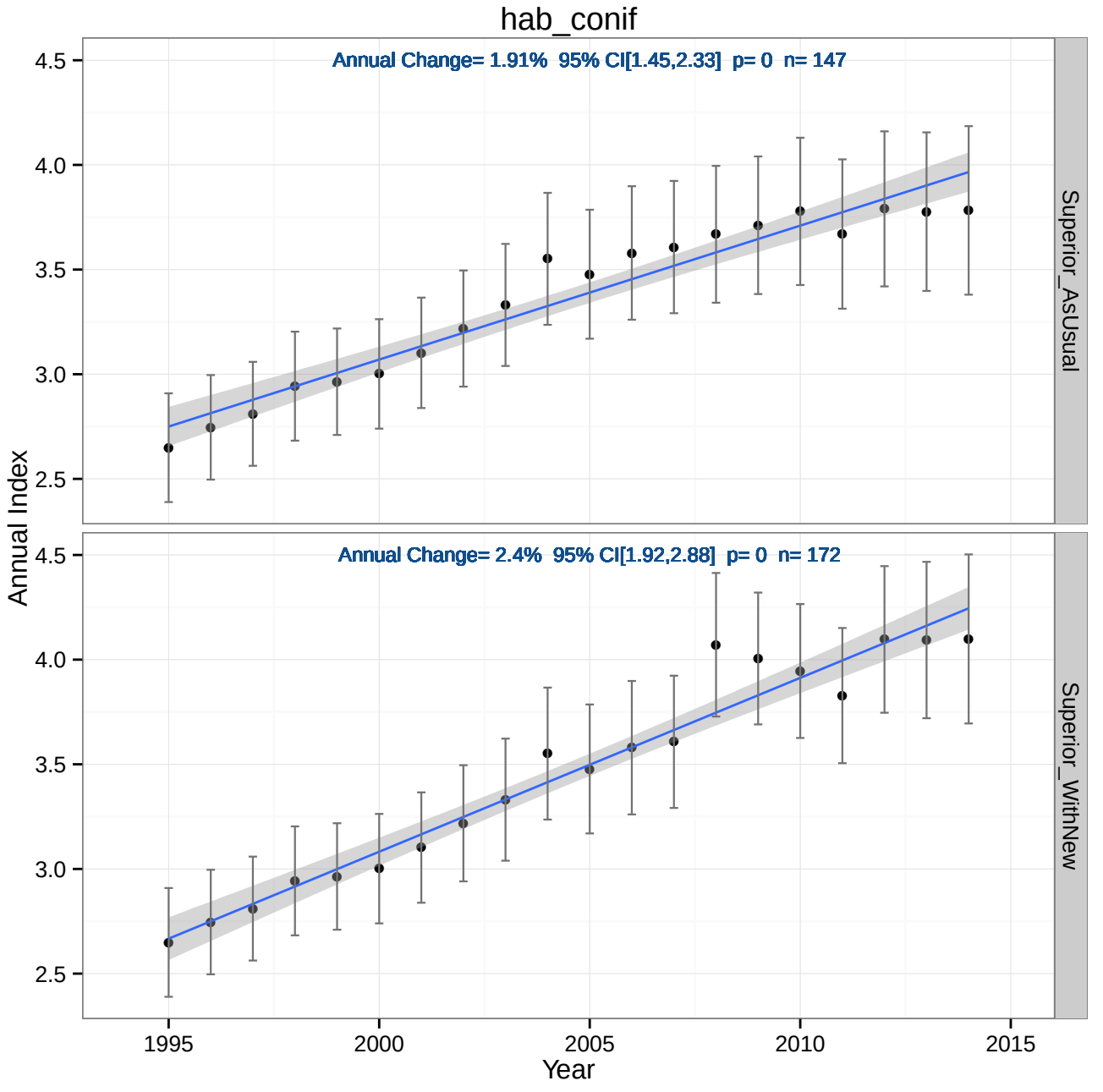

Eastern Wood−Pewee
Annual Change= −0.92% 95% CI[−4.54,2.93] p= 0.544 n= 27
Annual Change= −0.92% 95% CI[−4.32,3.12] p= 0.6 n= 27
Superior_AsUsual
Superior_WithNew
Annual Index
Year
0.7
0.6
0.5
0.4
0.3
0.2
1995
2000
2005
2010
2015

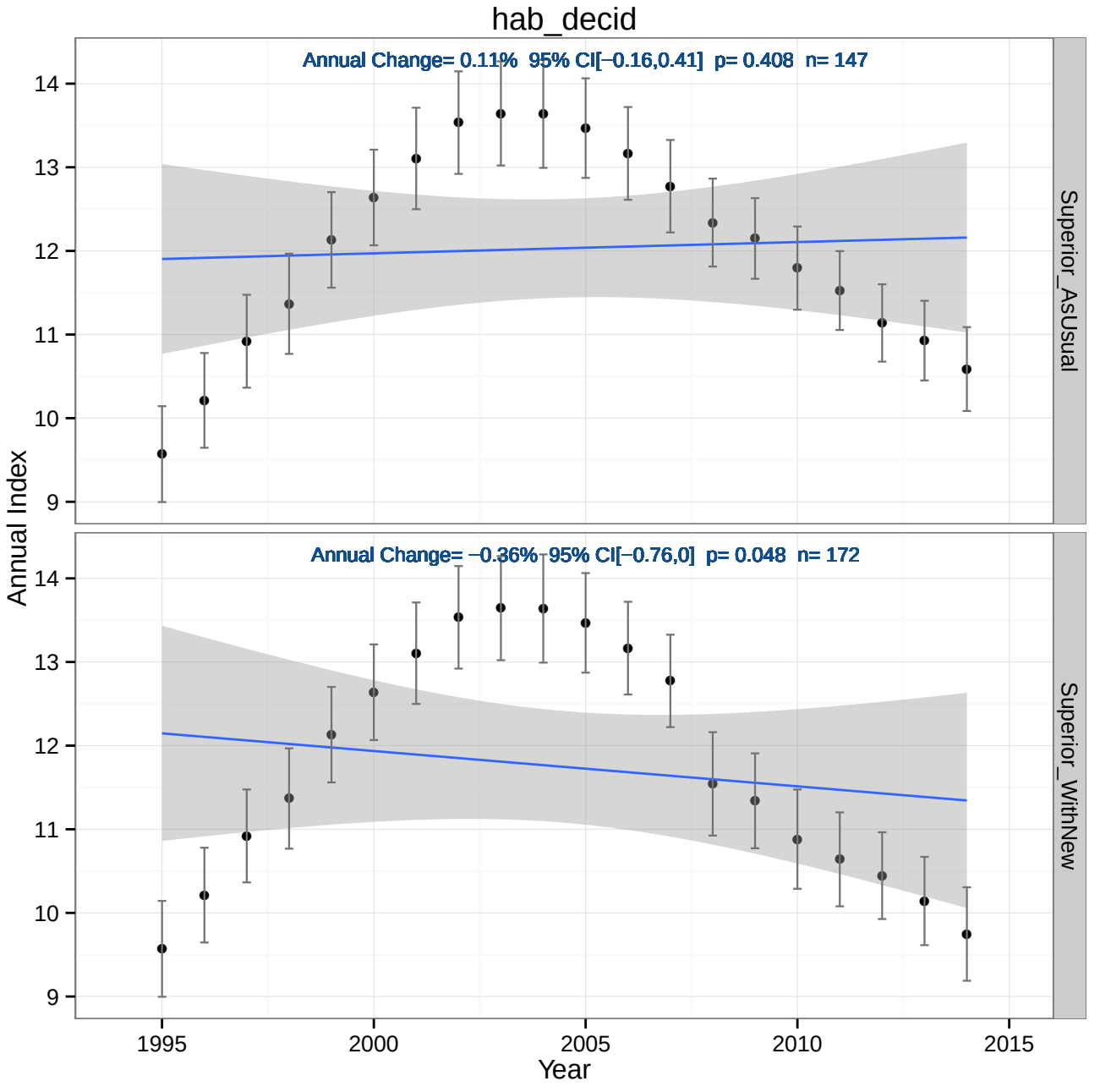

Evening Grosbeak
Annual Change= −9.57% 95% CI[−15.39,−3.15] p= 0.004 n= 10
Annual Change= −9.57% 95% CI[−16.48,−3.35] p= 0 n= 10
Superior_AsUsual
Superior_WithNew
Annual Index
0.0
0.2
0.4
0.6
1995
2000
2005
2010
2015
Year

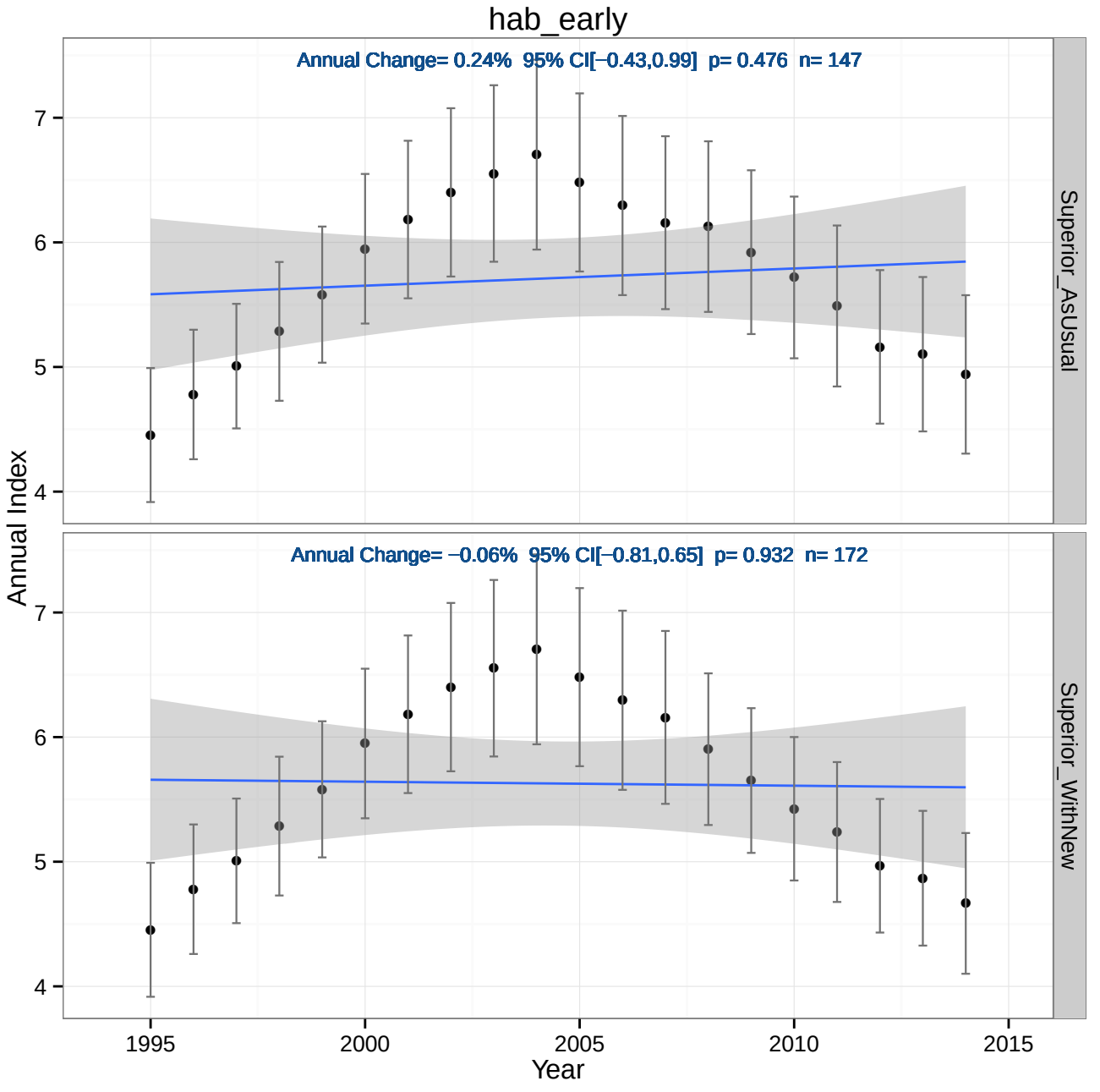

Golden−crowned Kinglet
Annual Change= 3.25% 95% CI[1.83,4.78] p= 0 n= 73
Annual Change= 4.93% 95% CI[3.29,6.34] p= 0 n= 91
Superior_AsUsual
Superior_WithNew
Annual Index
Year
0.2
0.4
0.6
0.8
1995
2000
2005
2010
2015

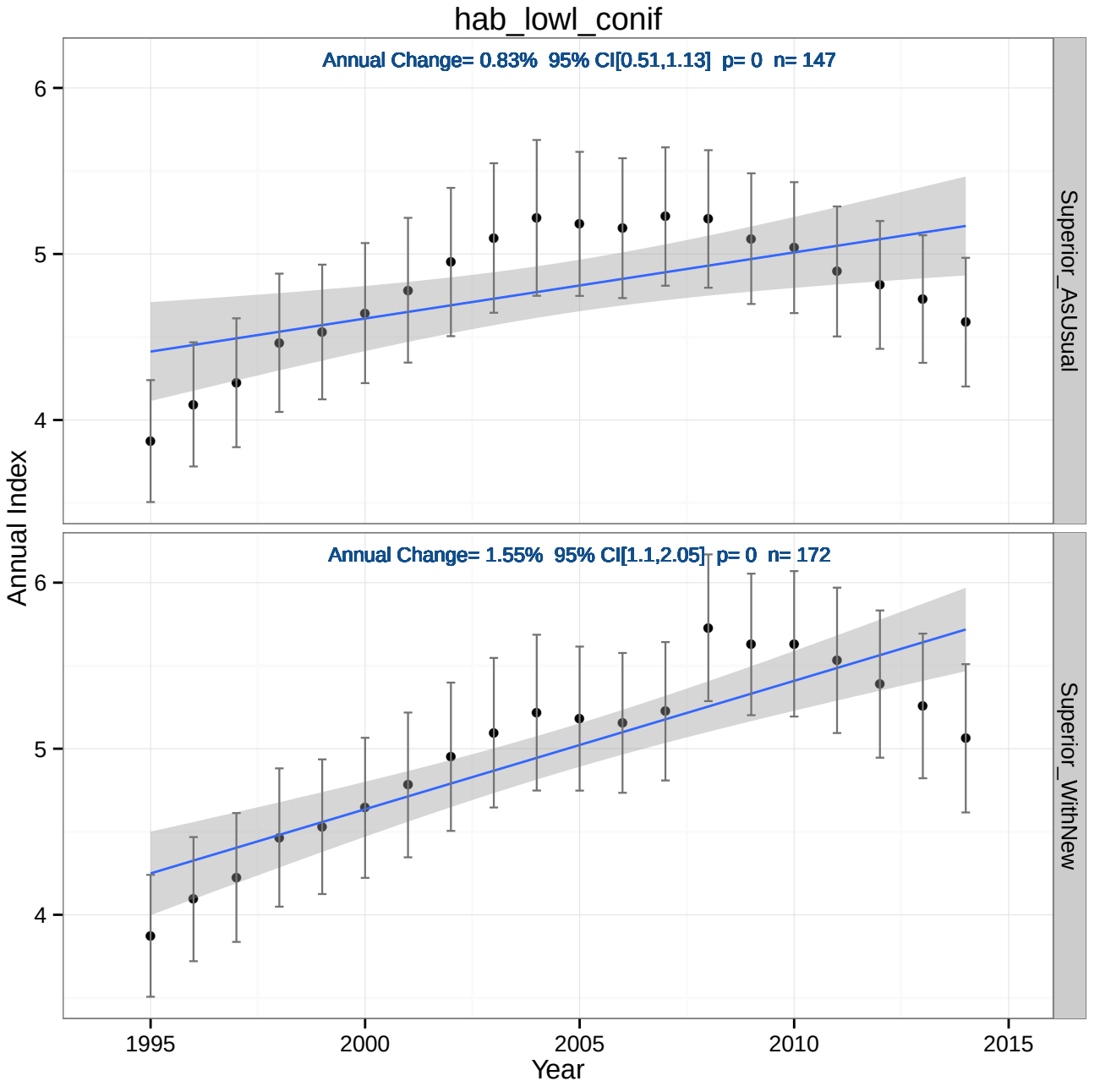

Gray Jay
Annual Change= 2.12% 95% CI[0.15,4.08] p= 0.028 n= 40
Annual Change= 2.12% 95% CI[0.07,4.25] p= 0.04 n= 40
Superior_AsUsual
Superior_WithNew
Annual Index
0.2
0.3
0.4
1995
2000
2005
2010
2015
Year

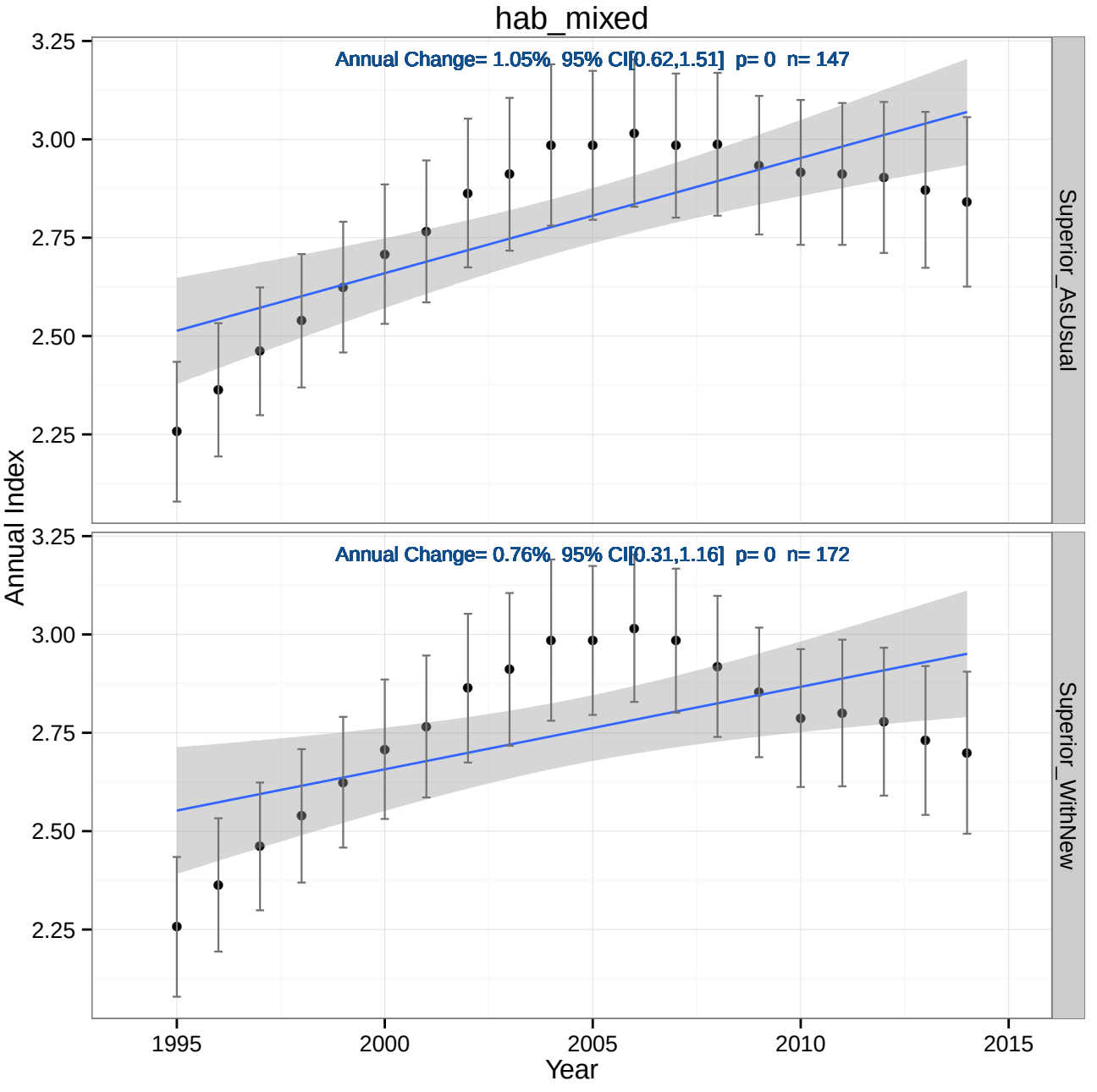

Golden−winged Warbler
Annual Change= 3.19% 95% CI[−1.68,6.48] p= 0.156 n= 12
Annual Change= 3.19% 95% CI[−1.47,6.31] p= 0.132 n= 12
Superior_AsUsual
Superior_WithNew
Annual Index
0.0
0.4
0.8
1995
2000
2005
2010
2015
Year

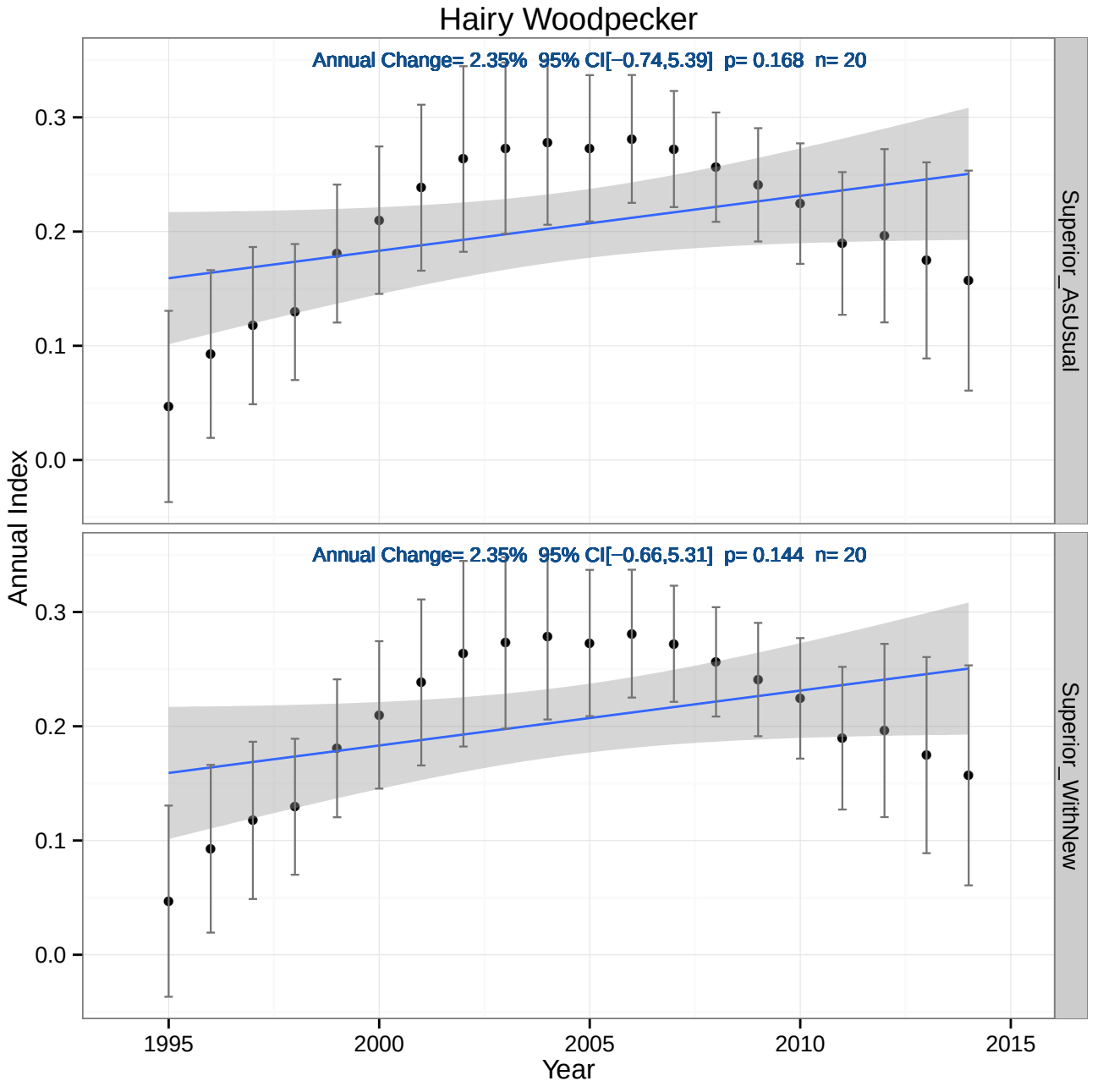

hab_conif
Annual Change= 1.91% 95% CI[1.45,2.33] p= 0 n= 147
Annual Change= 2.4% 95% CI[1.92,2.88] p= 0 n= 172
Superior_AsUsual
Superior_WithNew
Annual Index
Year
4.5
4.0
3.5
3.0
2.5
1995
2000
2005
2010
2015

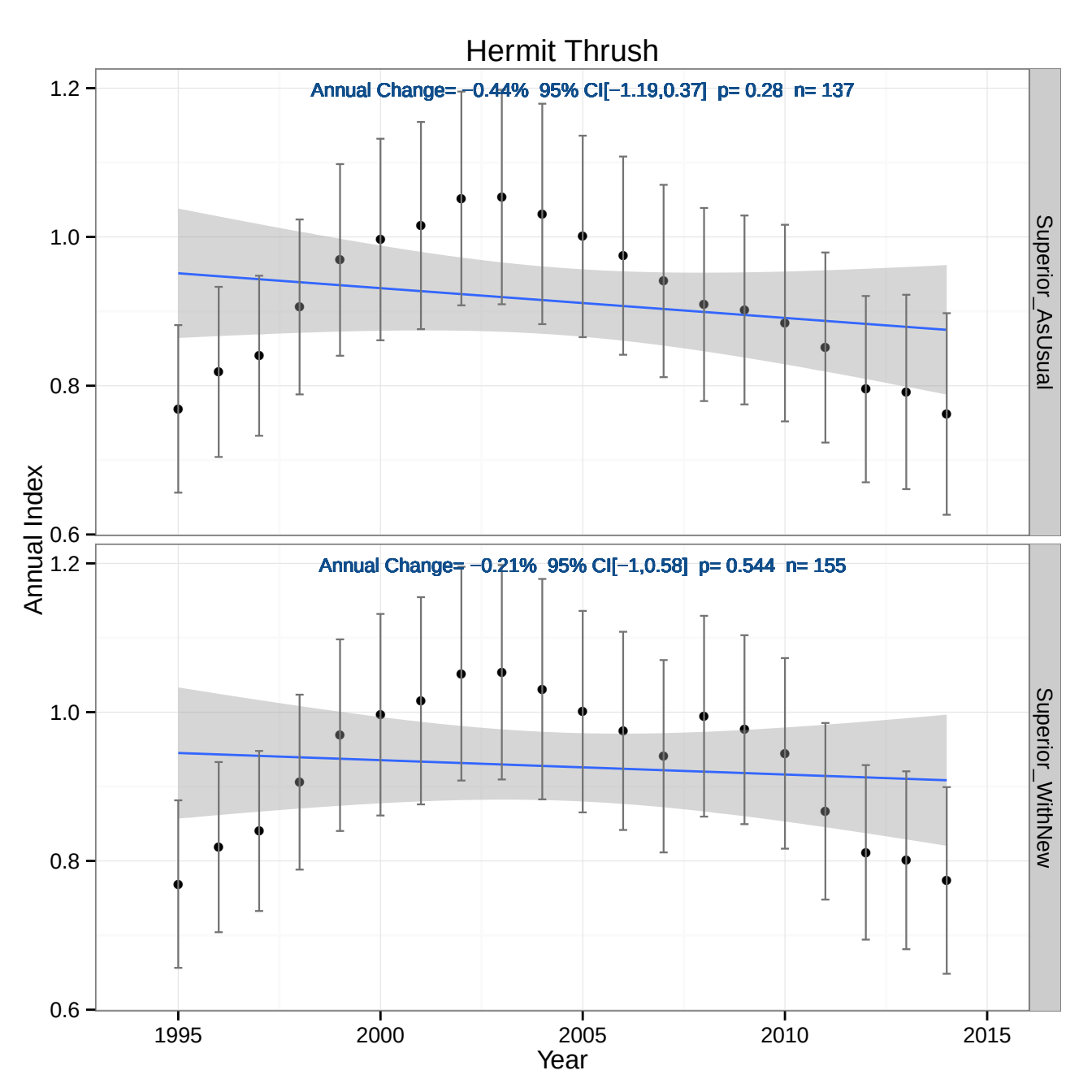

hab_decid
Annual Change= 0.11% 95% CI[−0.16,0.41] p= 0.408 n= 147
Annual Change= −0.36% 95% CI[−0.76,0] p= 0.048 n= 172
Superior_AsUsual
Superior_WithNew
Annual Index
Year
14
13
12
11
10
9
1995
2000
2005
2010
2015

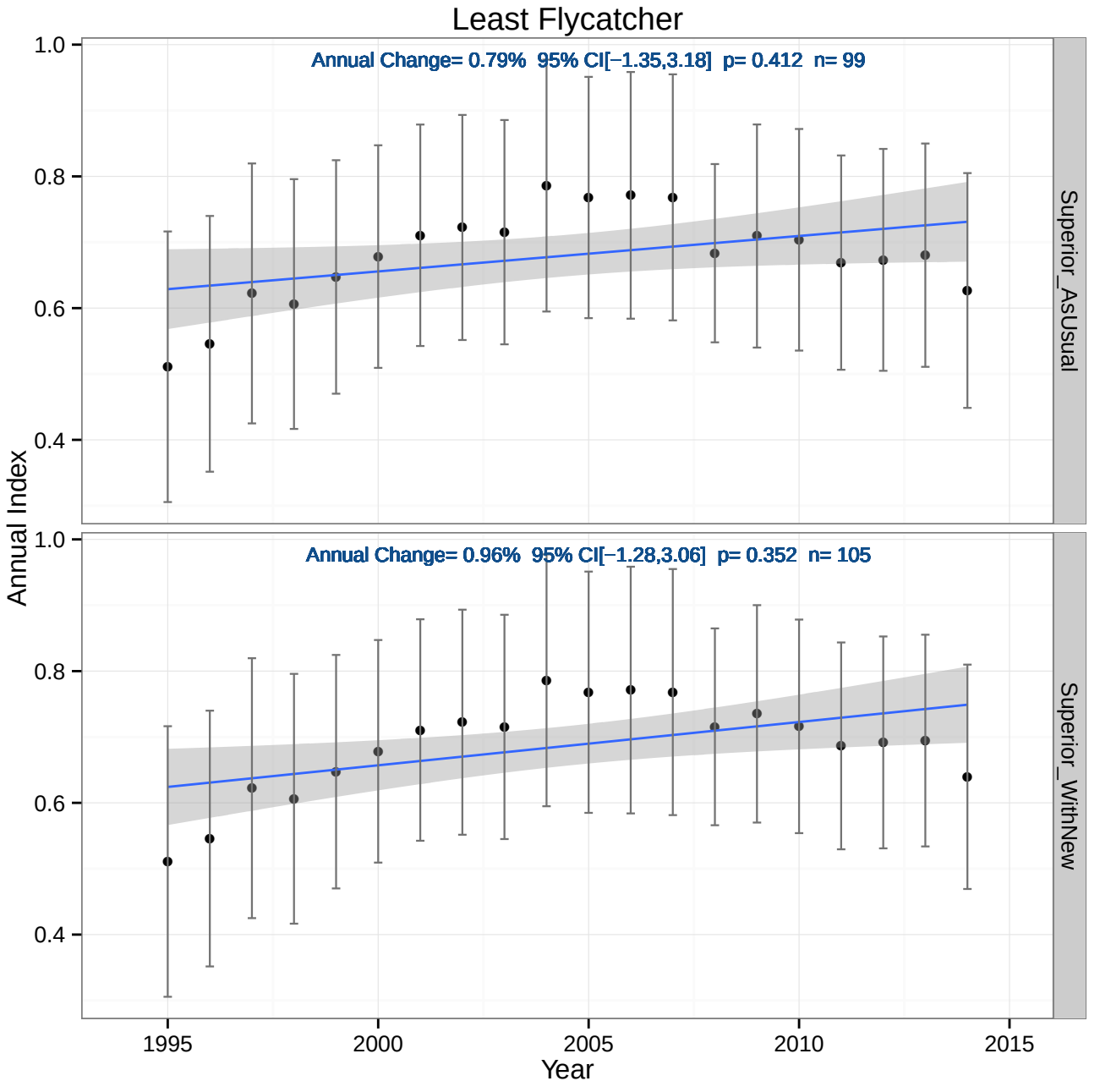

hab_early
Annual Change= 0.24% 95% CI[−0.43,0.99] p= 0.476 n= 147
Annual Change= −0.06% 95% CI[−0.81,0.65] p= 0.932 n= 172
Superior_AsUsual
Superior_WithNew
Annual Index
Year
4
5
6
7
1995
2000
2005
2010
2015

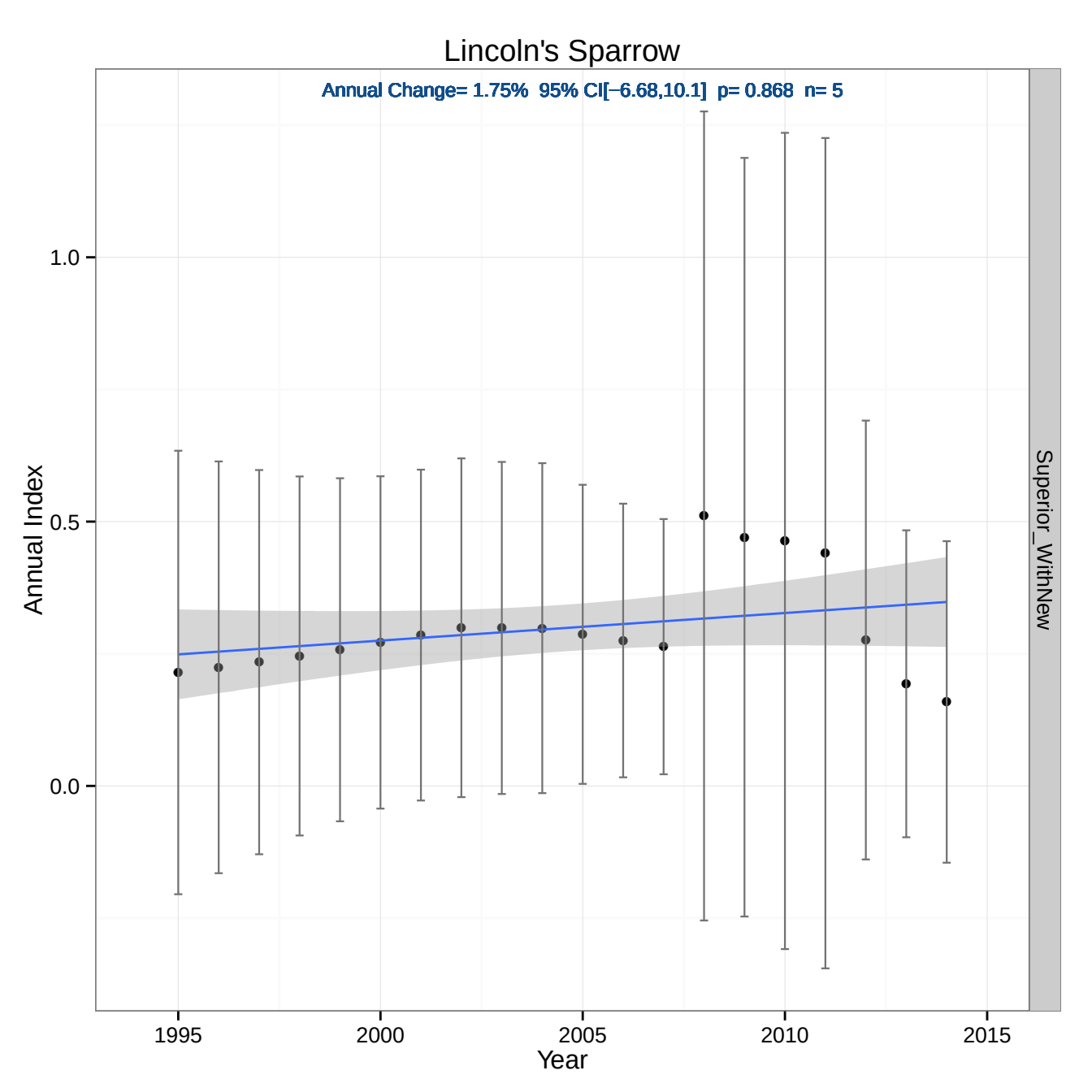

hab_lowl_conif
Annual Change= 0.83% 95% CI[0.51,1.13] p= 0 n= 147
Annual Change= 1.55% 95% CI[1.1,2.05] p= 0 n= 172
Superior_AsUsual
Superior_WithNew
Annual Index
Year
6
5
4
1995
2000
2005
2010
2015

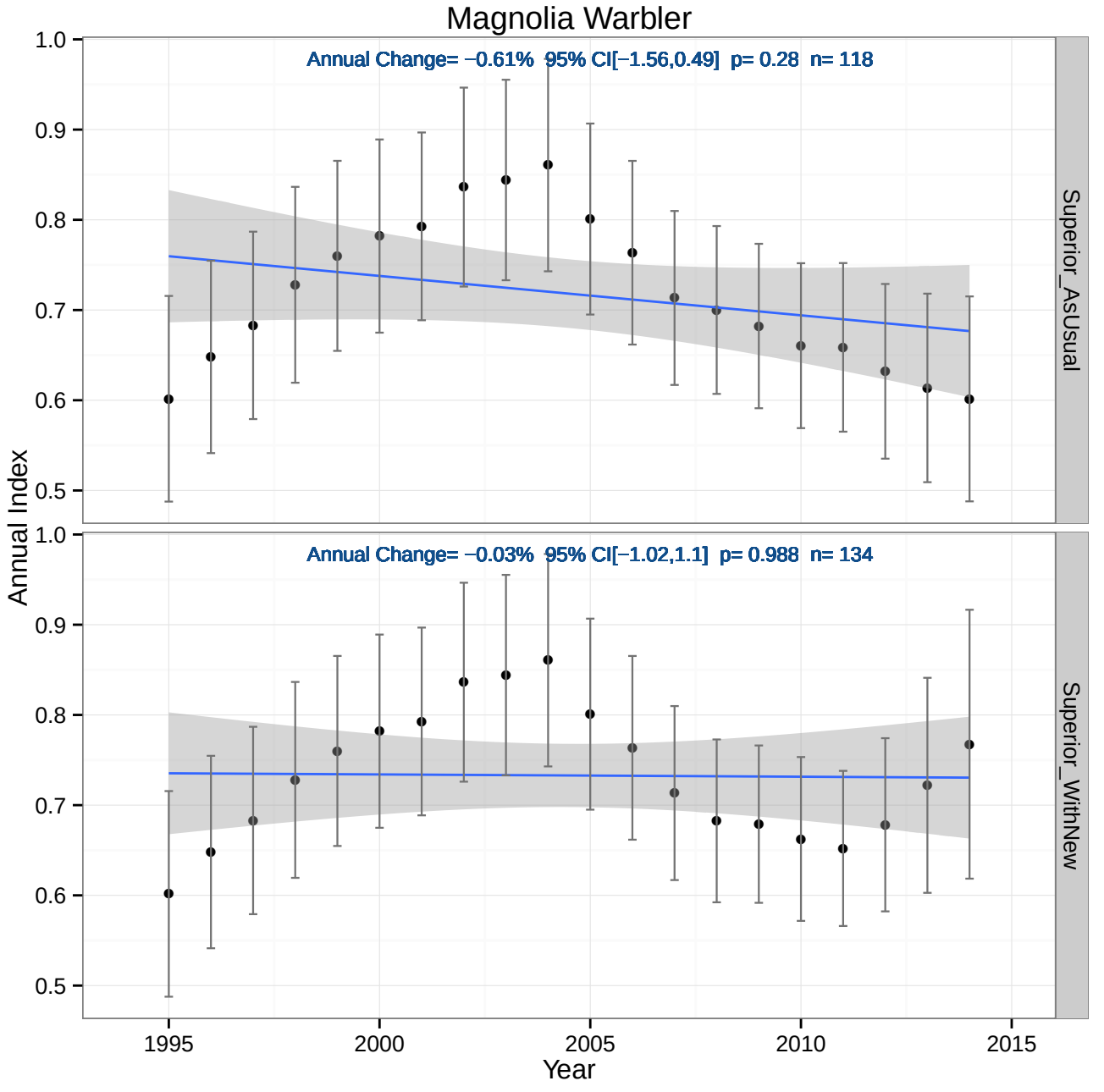

hab_mixed
Annual Change= 1.05% 95% CI[0.62,1.51] p= 0 n= 147
Annual Change= 0.76% 95% CI[0.31,1.16] p= 0 n= 172
Superior_AsUsual
Superior_WithNew
Annual Index
Year
3.25
3.00
2.75
2.50
2.25
1995
2000
2005
2010
2015

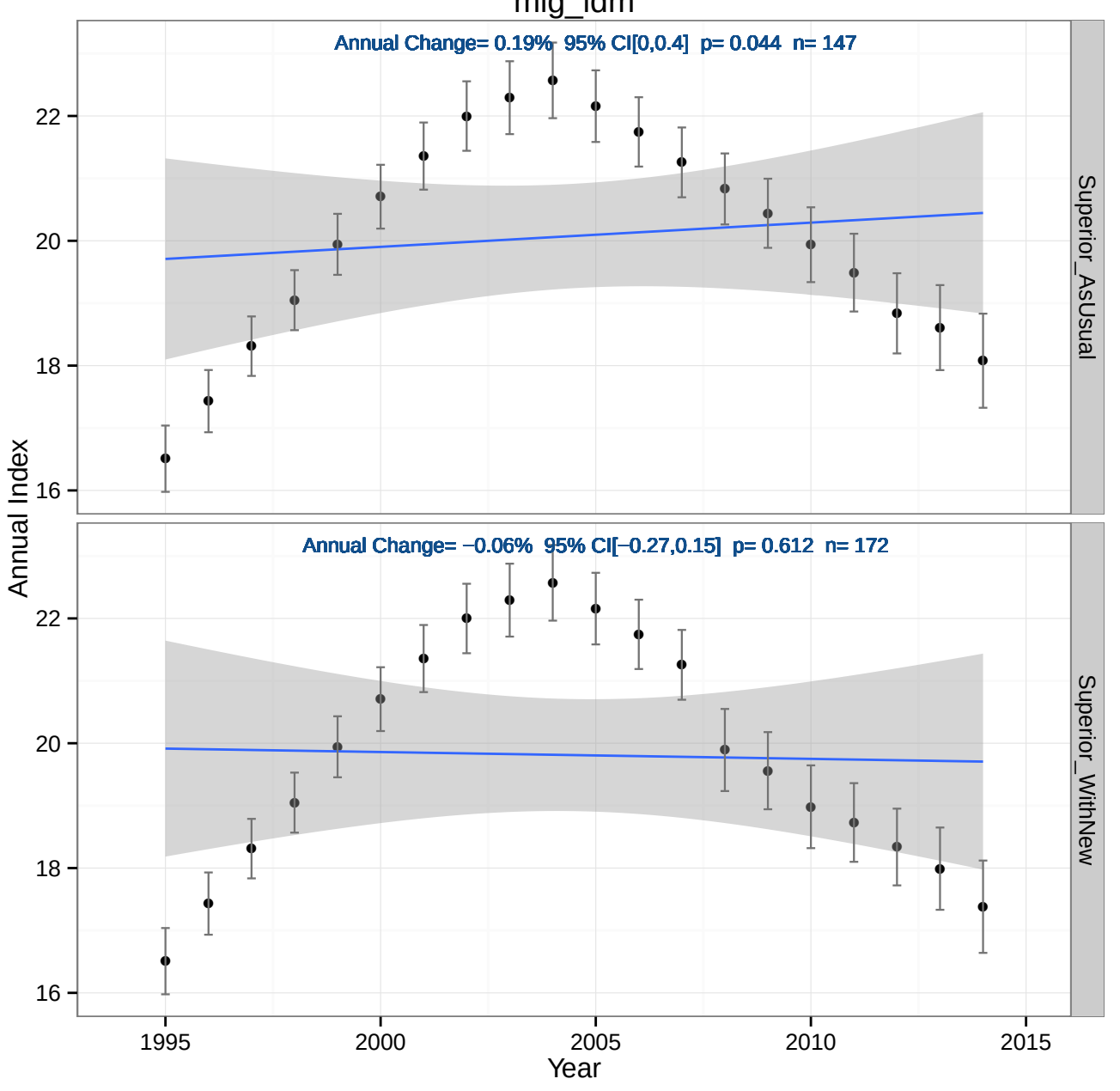

Hairy Woodpecker
Annual Change= 2.35% 95% CI[−0.74,5.39] p= 0.168 n= 20
Annual Change= 2.35% 95% CI[−0.66,5.31] p= 0.144 n= 20
Superior_AsUsual
Superior_WithNew
Annual Index
0.0
0.1
0.2
0.3
1995
2000
2005
2010
2015
Year

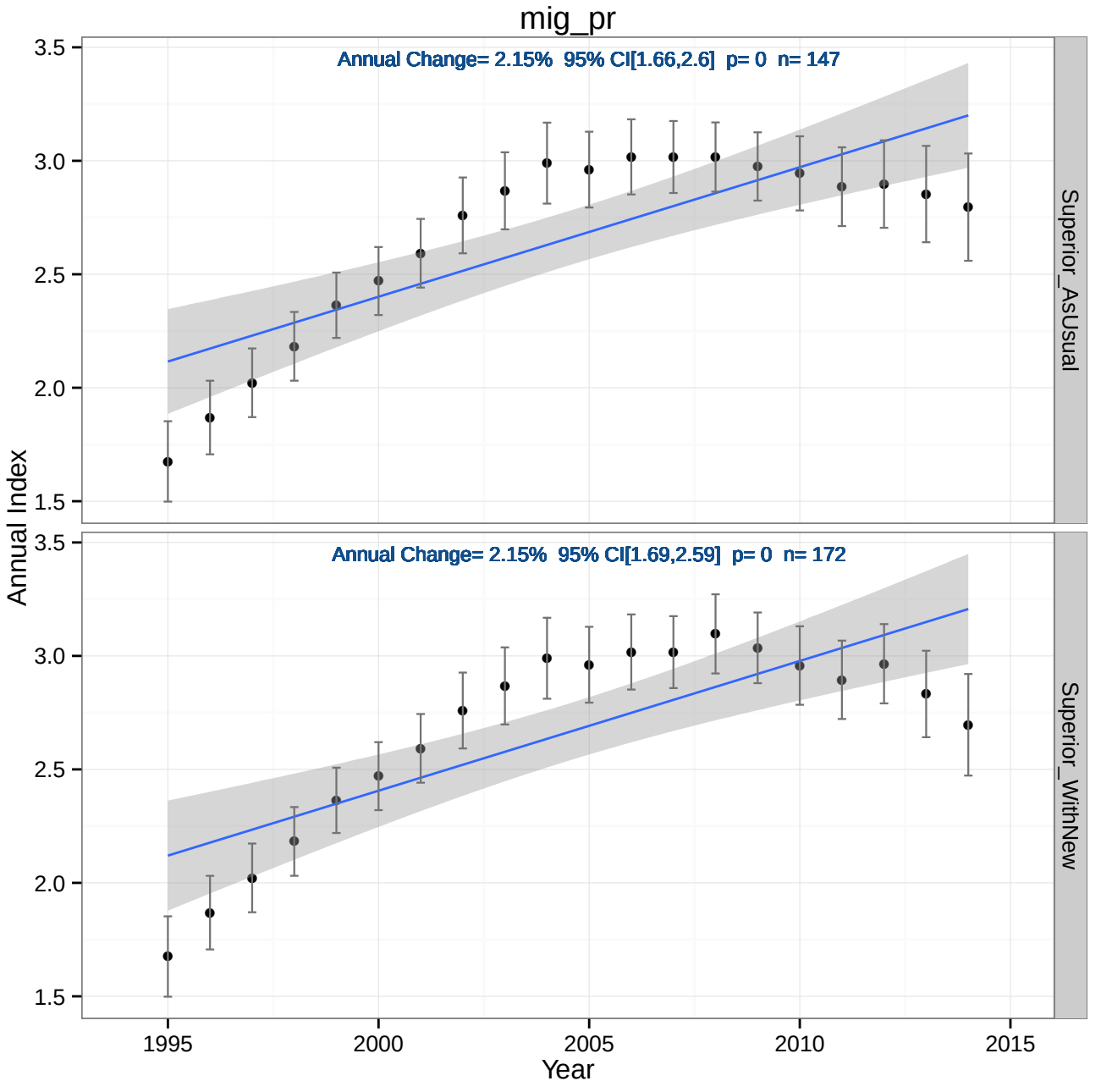

Hermit Thrush
Annual Change= −0.44% 95% CI[−1.19,0.37] p= 0.28 n= 137
Annual Change= −0.21% 95% CI[−1,0.58] p= 0.544 n= 155
Superior_AsUsual
Superior_WithNew
Annual Index
Year
1.2
1.0
0.8
0.6
1995
2000
2005
2010
2015

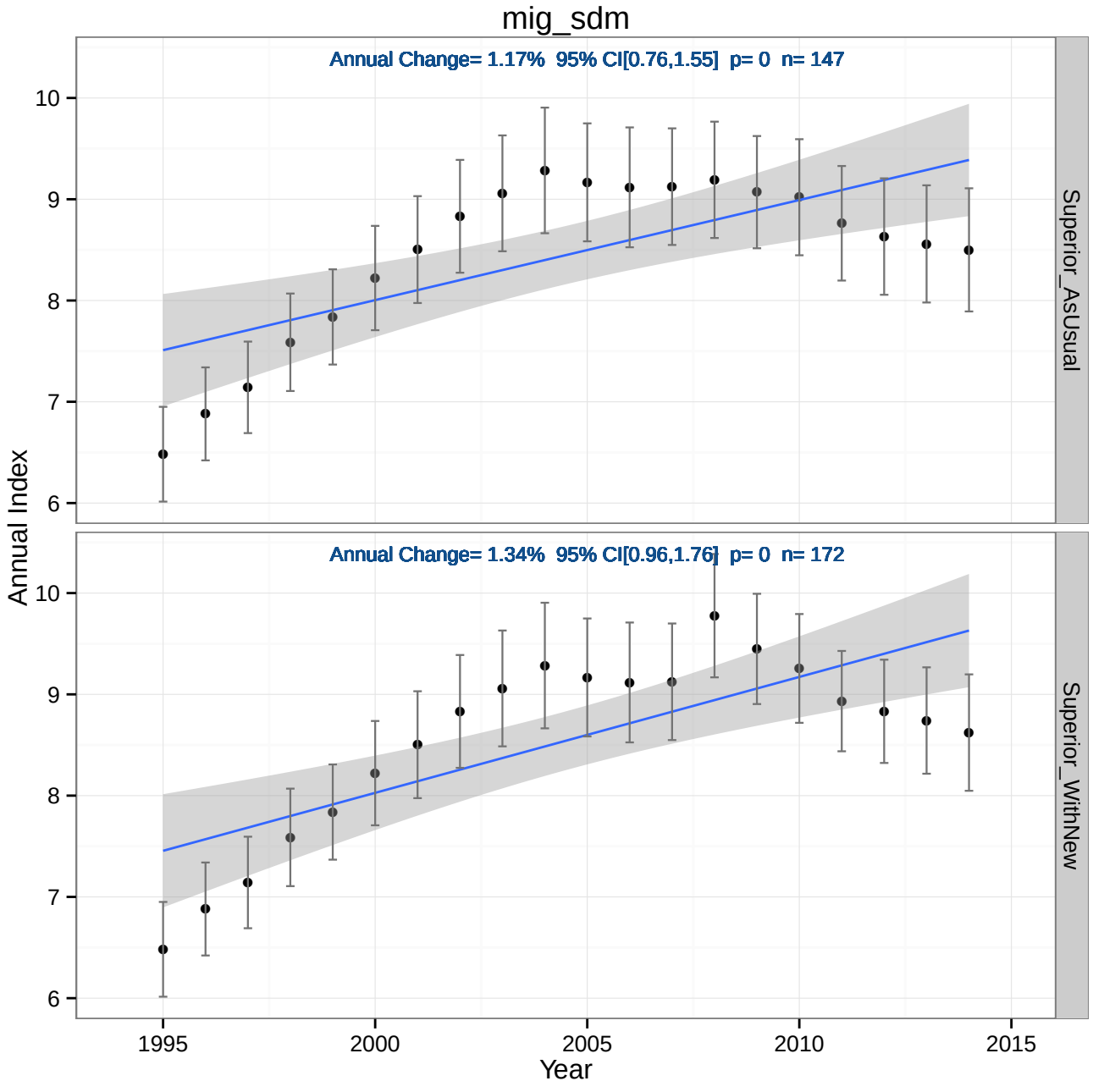

Least Flycatcher
Annual Change= 0.79% 95% CI[−1.35,3.18] p= 0.412 n= 99
Annual Change= 0.96% 95% CI[−1.28,3.06] p= 0.352 n= 105
Superior_AsUsual
Superior_WithNew
Annual Index
Year
1.0
0.8
0.6
0.4
1995
2000
2005
2010
2015

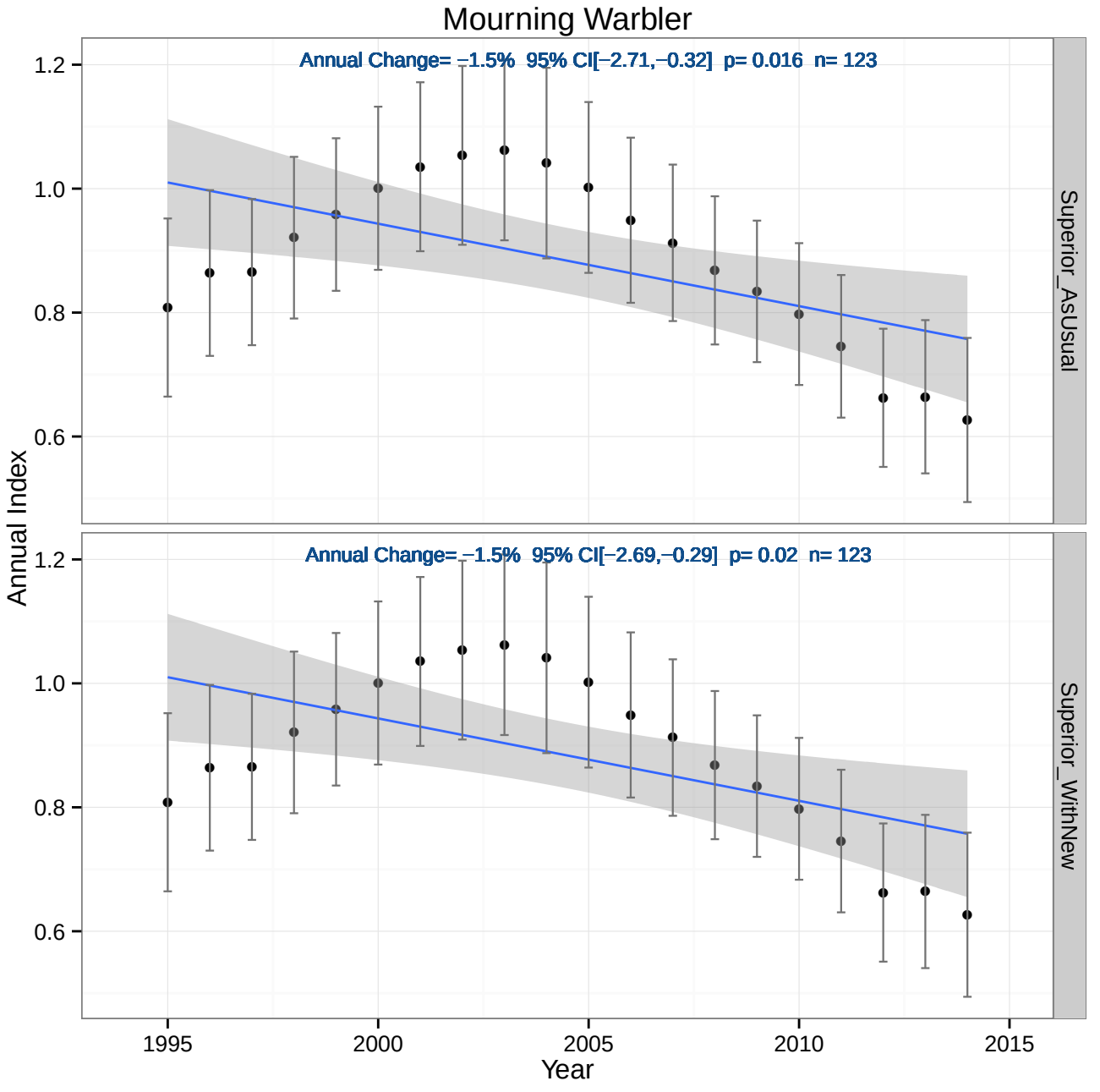

Lincoln's Sparrow
Annual Change= 1.75% 95% CI[−6.68,10.1] p= 0.868 n= 5
Annual Index
1.0
0.5
0.0
1995
2000
2005
2010
2015
Year
Superior_WithNew

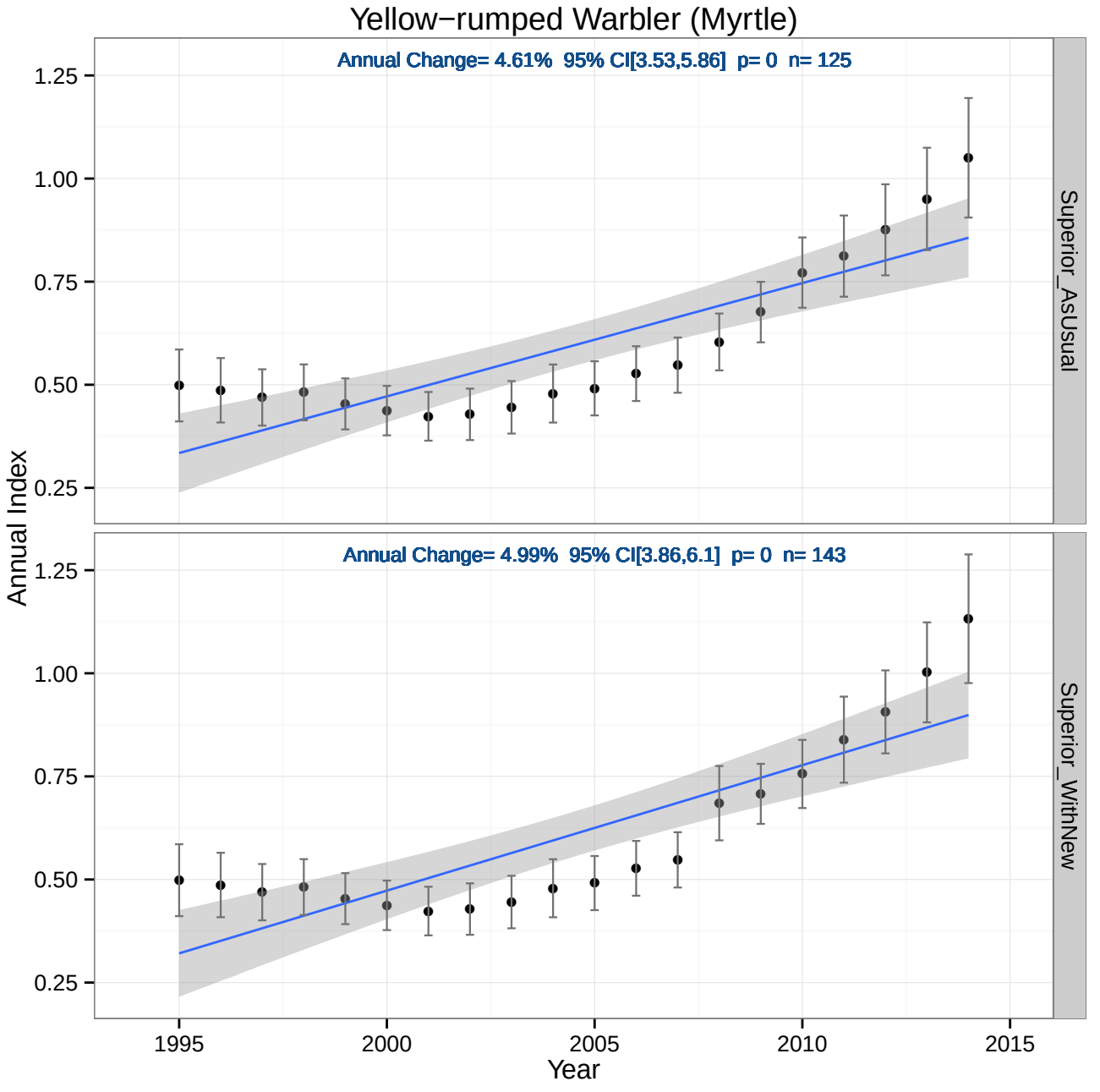

Magnolia Warbler
Annual Change= −0.61% 95% CI[−1.56,0.49] p= 0.28 n= 118
Annual Change= −0.03% 95% CI[−1.02,1.1] p= 0.988 n= 134
Superior_AsUsual
Superior_WithNew
Annual Index
Year
1.0
0.9
0.8
0.7
0.6
0.5
1995
2000
2005
2010
2015

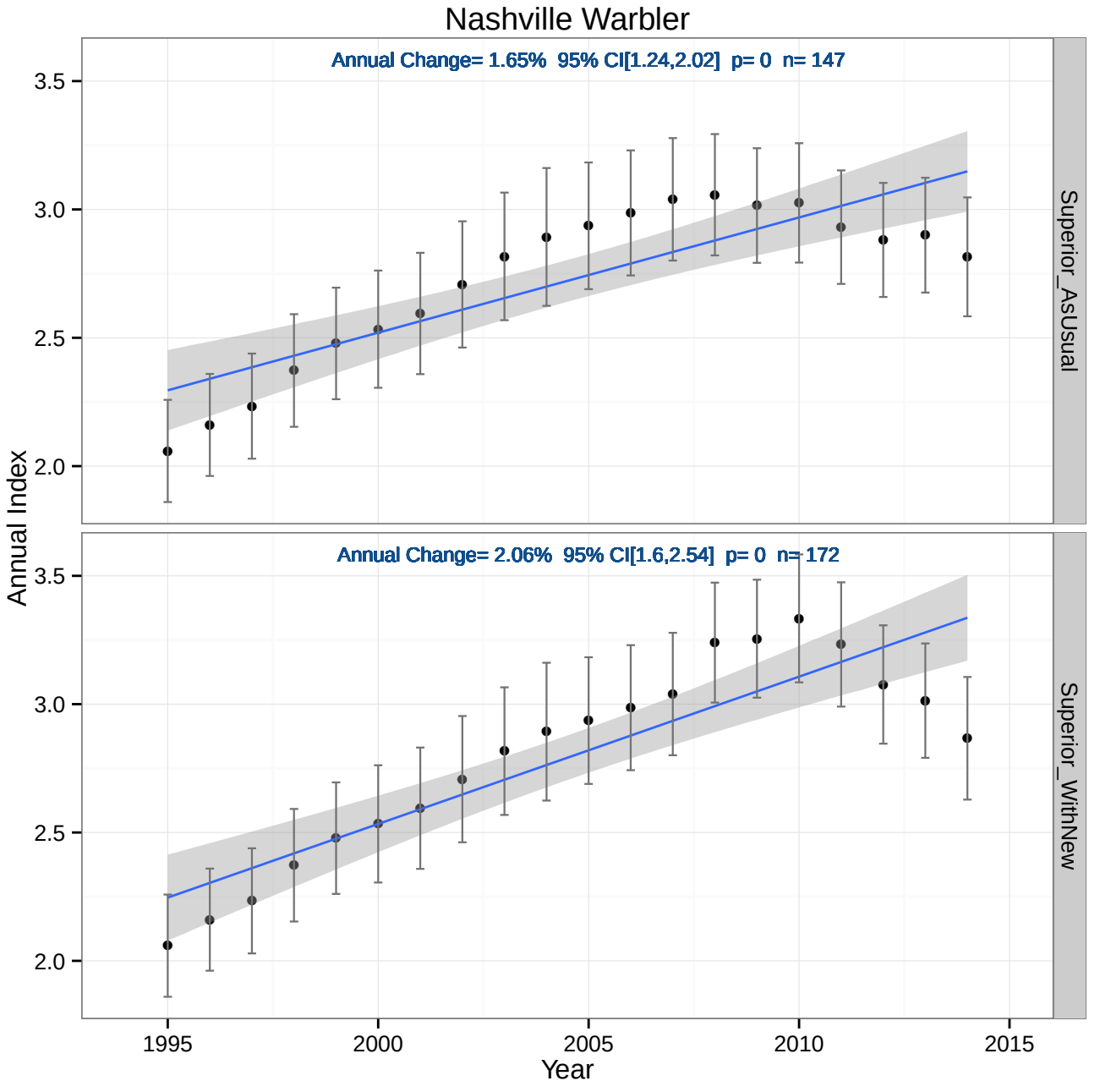

mig_ldm
Annual Change= 0.19% 95% CI[0,0.4] p= 0.044 n= 147
Annual Change= −0.06% 95% CI[−0.27,0.15] p= 0.612 n= 172
Superior_AsUsual
Superior_WithNew
Annual Index
Year
16
18
20
22
1995
2000
2005
2010
2015

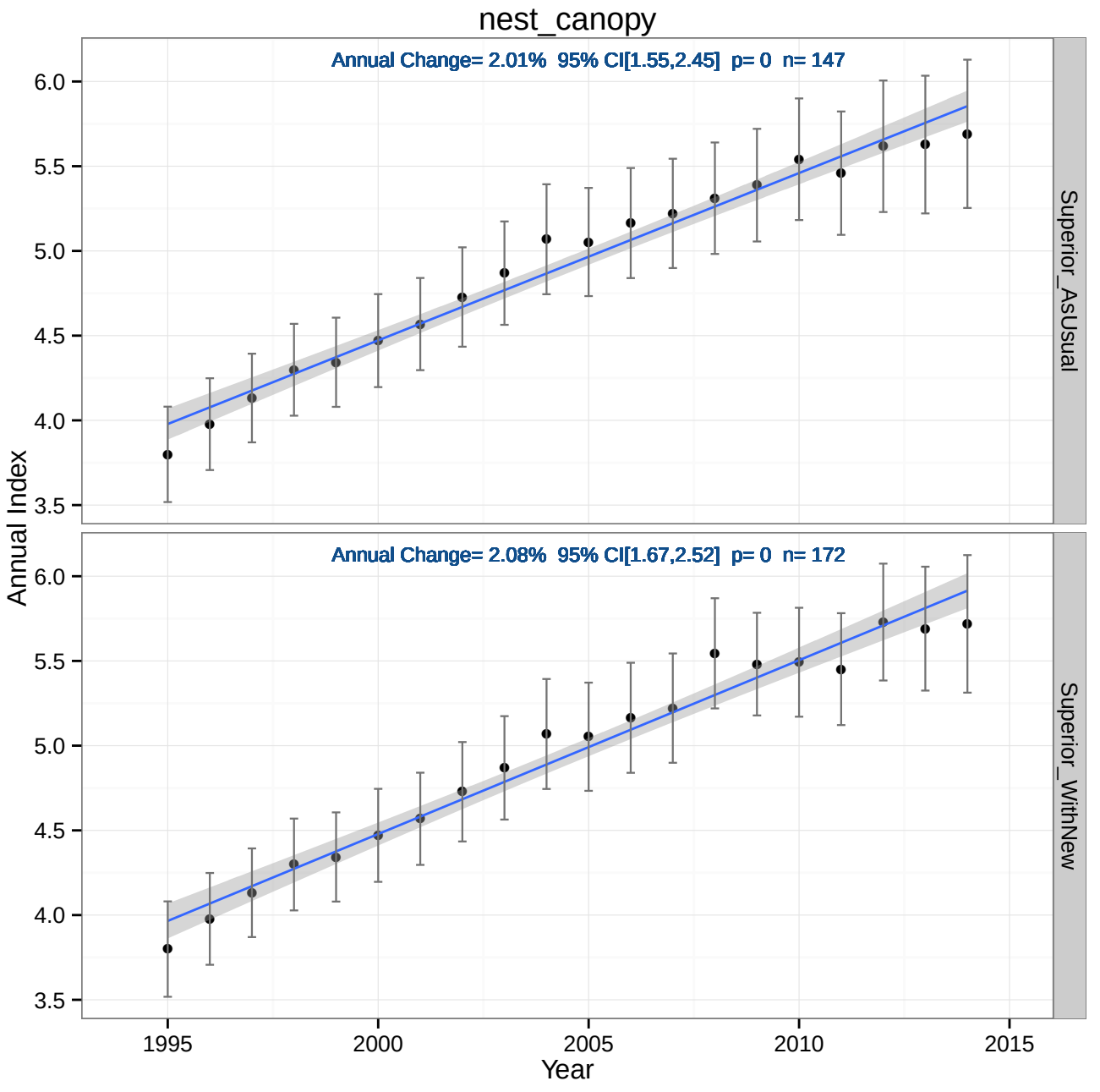

mig_pr
Annual Change= 2.15% 95% CI[1.66,2.6] p= 0 n= 147
Annual Change= 2.15% 95% CI[1.69,2.59] p= 0 n= 172
Superior_AsUsual
Superior_WithNew
Annual Index
Year
3.5
3.0
2.5
2.0
1.5
1995
2000
2005
2010
2015

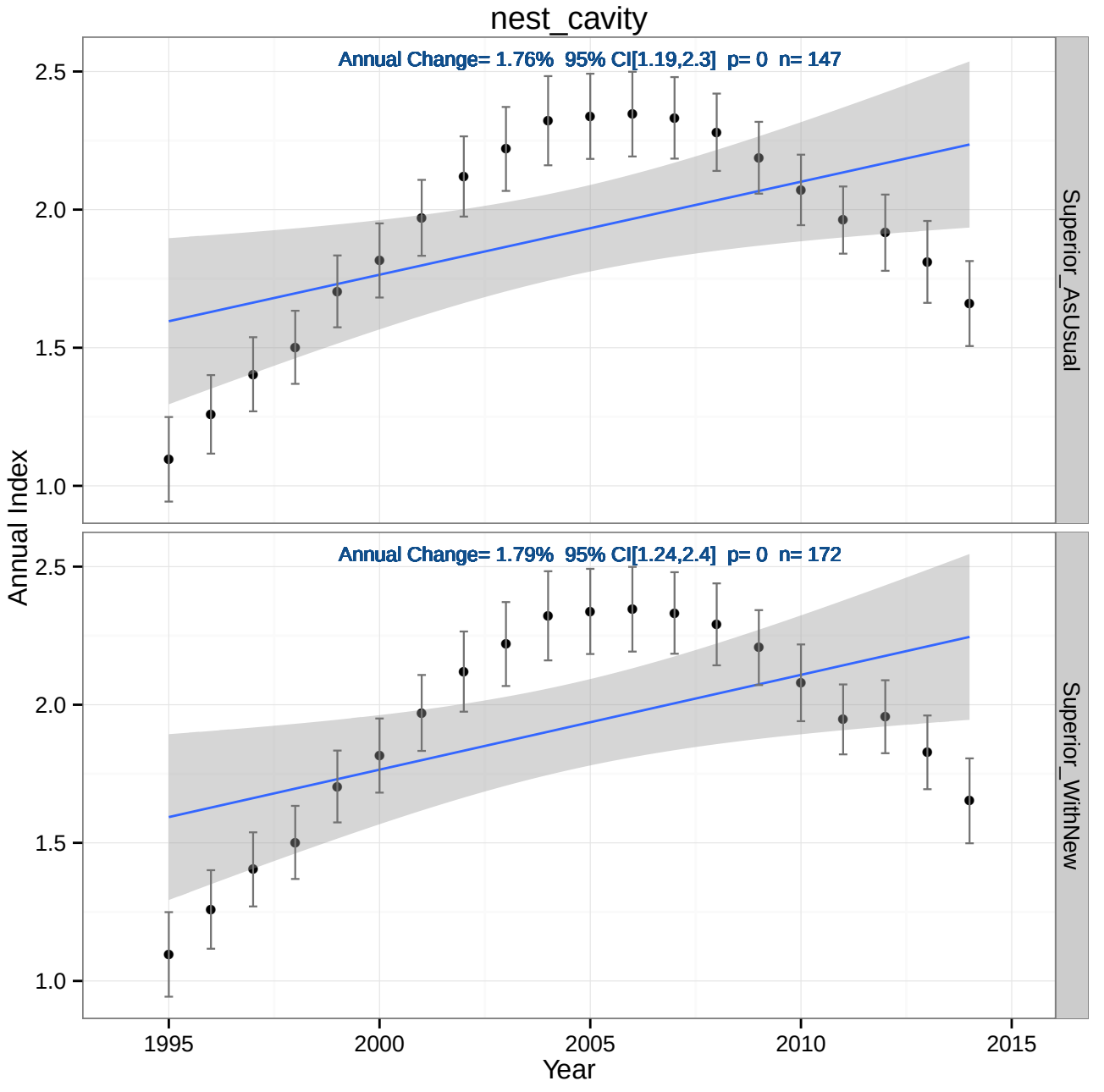

mig_sdm
Annual Change= 1.17% 95% CI[0.76,1.55] p= 0 n= 147
Annual Change= 1.34% 95% CI[0.96,1.76] p= 0 n= 172
Superior_AsUsual
Superior_WithNew
Annual Index
Year
10
9
8
7
6
1995
2000
2005
2010
2015

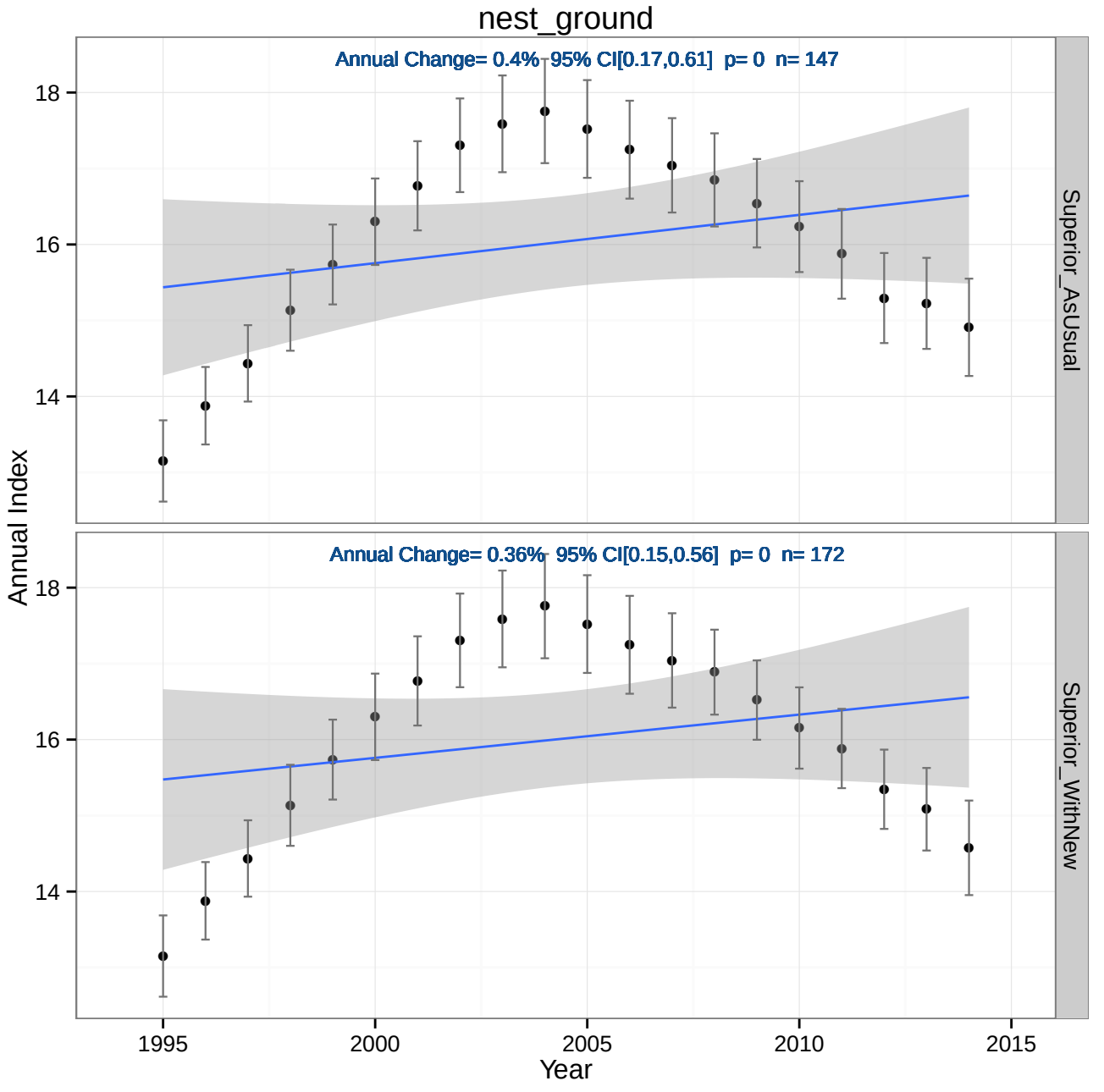

Mourning Warbler
Annual Change= −1.5% 95% CI[−2.71,−0.32] p= 0.016 n= 123
Annual Change= −1.5% 95% CI[−2.69,−0.29] p= 0.02 n= 123
Superior_AsUsual
Superior_WithNew
Annual Index
Year
1.2
1.0
0.8
0.6
1995
2000
2005
2010
2015

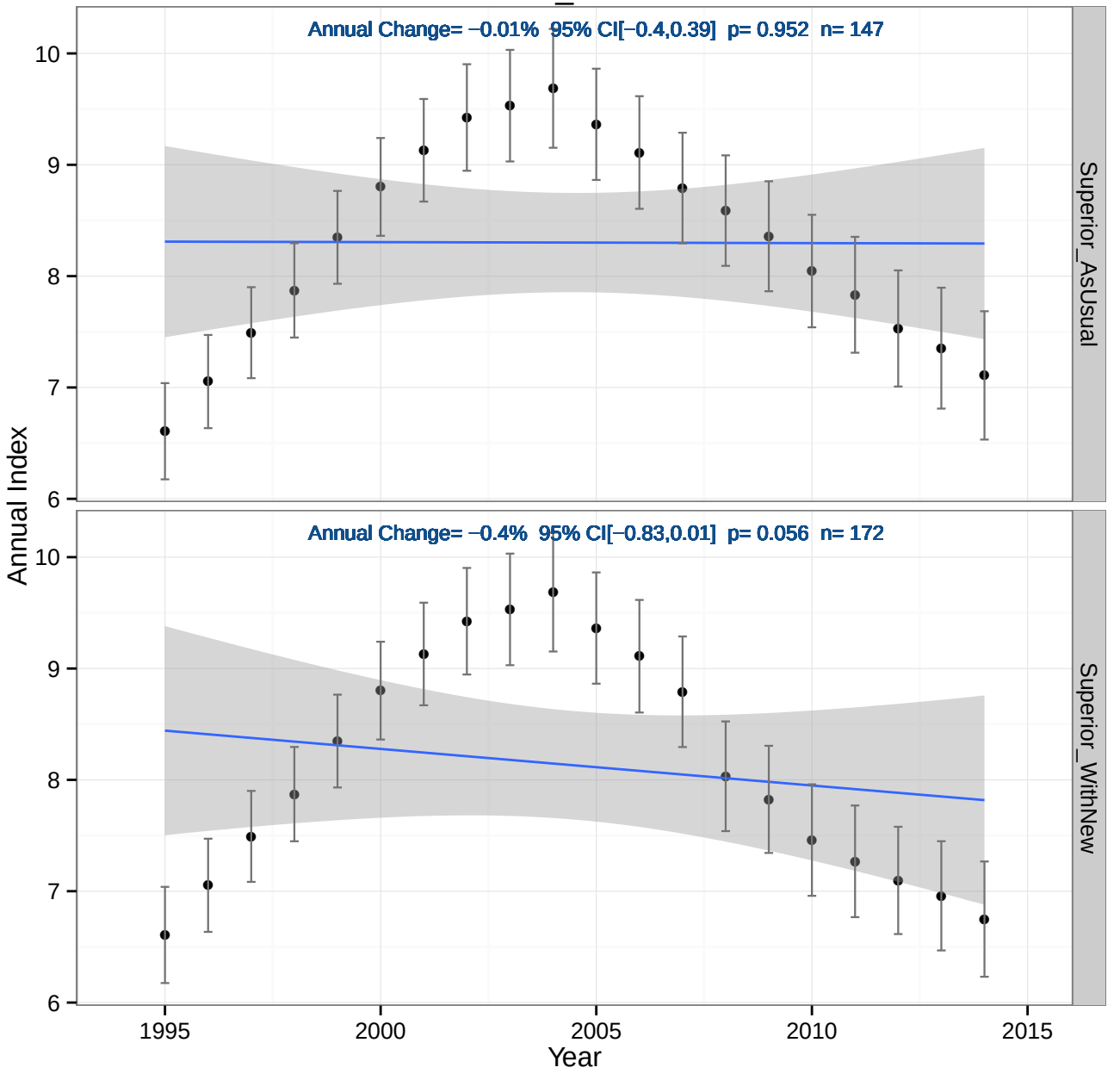

Yellow−rumped Warbler (Myrtle)
Annual Change= 4.61% 95% CI[3.53,5.86] p= 0 n= 125
Annual Change= 4.99% 95% CI[3.86,6.1] p= 0 n= 143
Superior_AsUsual
Superior_WithNew
Annual Index
1.25
1.00
0.75
0.50
0.25
1995
2000
2005
2010
2015
Year

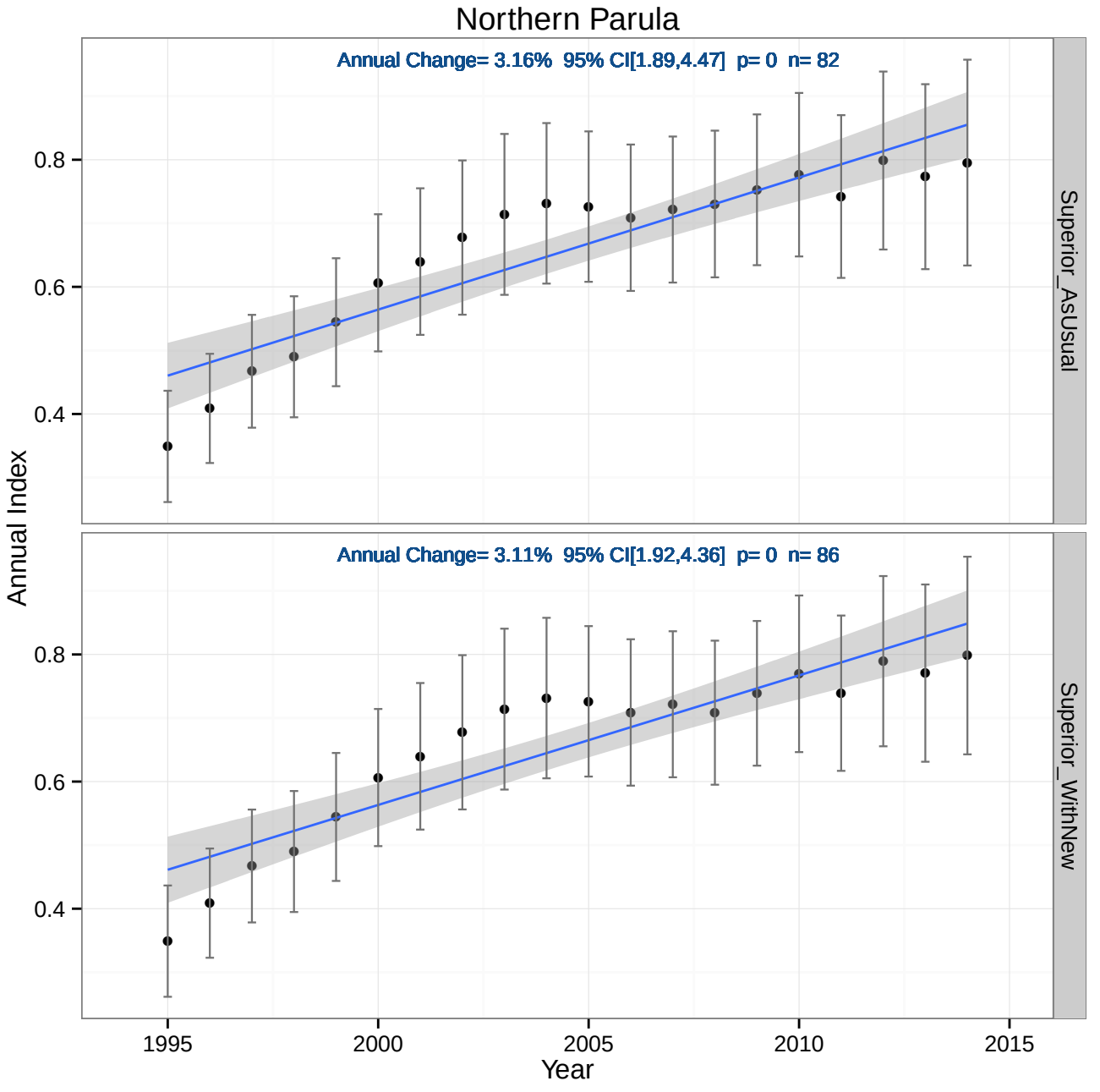

Nashville Warbler
Annual Change= 1.65% 95% CI[1.24,2.02] p= 0 n= 147
Annual Change= 2.06% 95% CI[1.6,2.54] p= 0 n= 172
Superior_AsUsual
Superior_WithNew
Annual Index
Year
3.5
3.0
2.5
2.0
1995
2000
2005
2010
2015

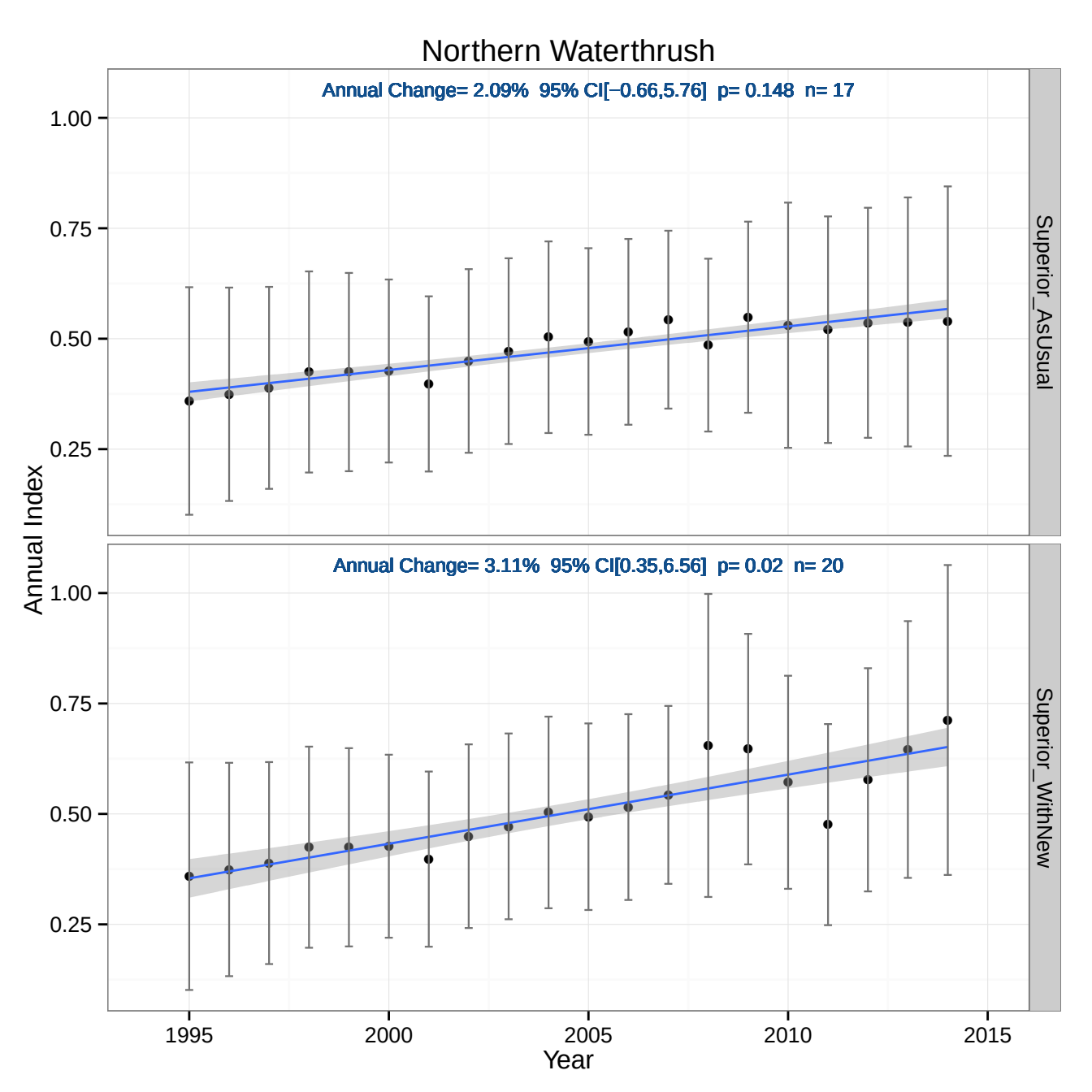

nest_canopy
Annual Change= 2.01% 95% CI[1.55,2.45] p= 0 n= 147
Annual Change= 2.08% 95% CI[1.67,2.52] p= 0 n= 172
Superior_AsUsual
Superior_WithNew
Annual Index
Year
6.0
5.5
5.0
4.5
4.0
3.5
1995
2000
2005
2010
2015

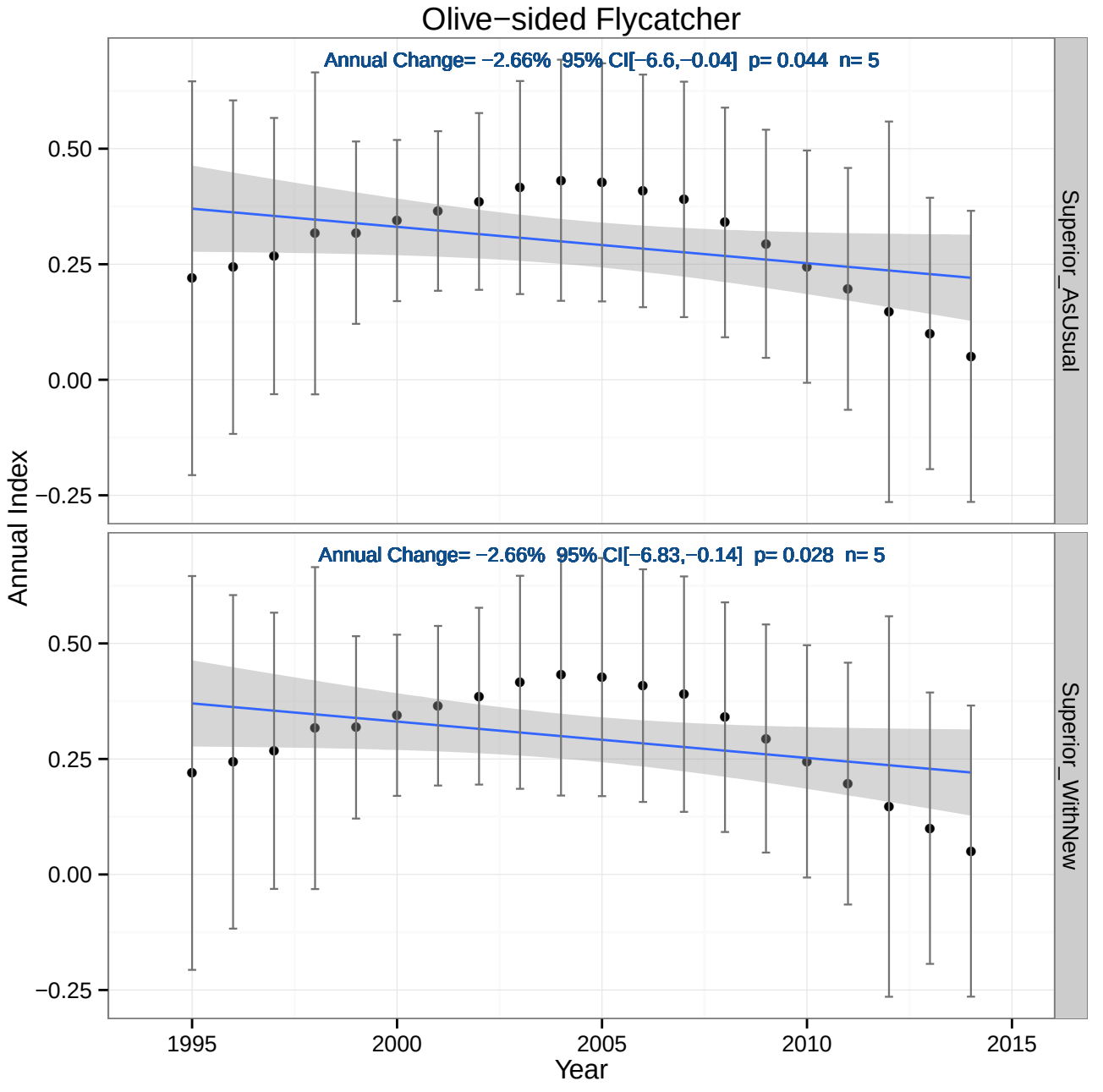

nest_cavity
Annual Change= 1.76% 95% CI[1.19,2.3] p= 0 n= 147
Annual Change= 1.79% 95% CI[1.24,2.4] p= 0 n= 172
Superior_AsUsual
Superior_WithNew
Annual Index
Year
2.5
2.0
1.5
1.0
1995
2000
2005
2010
2015

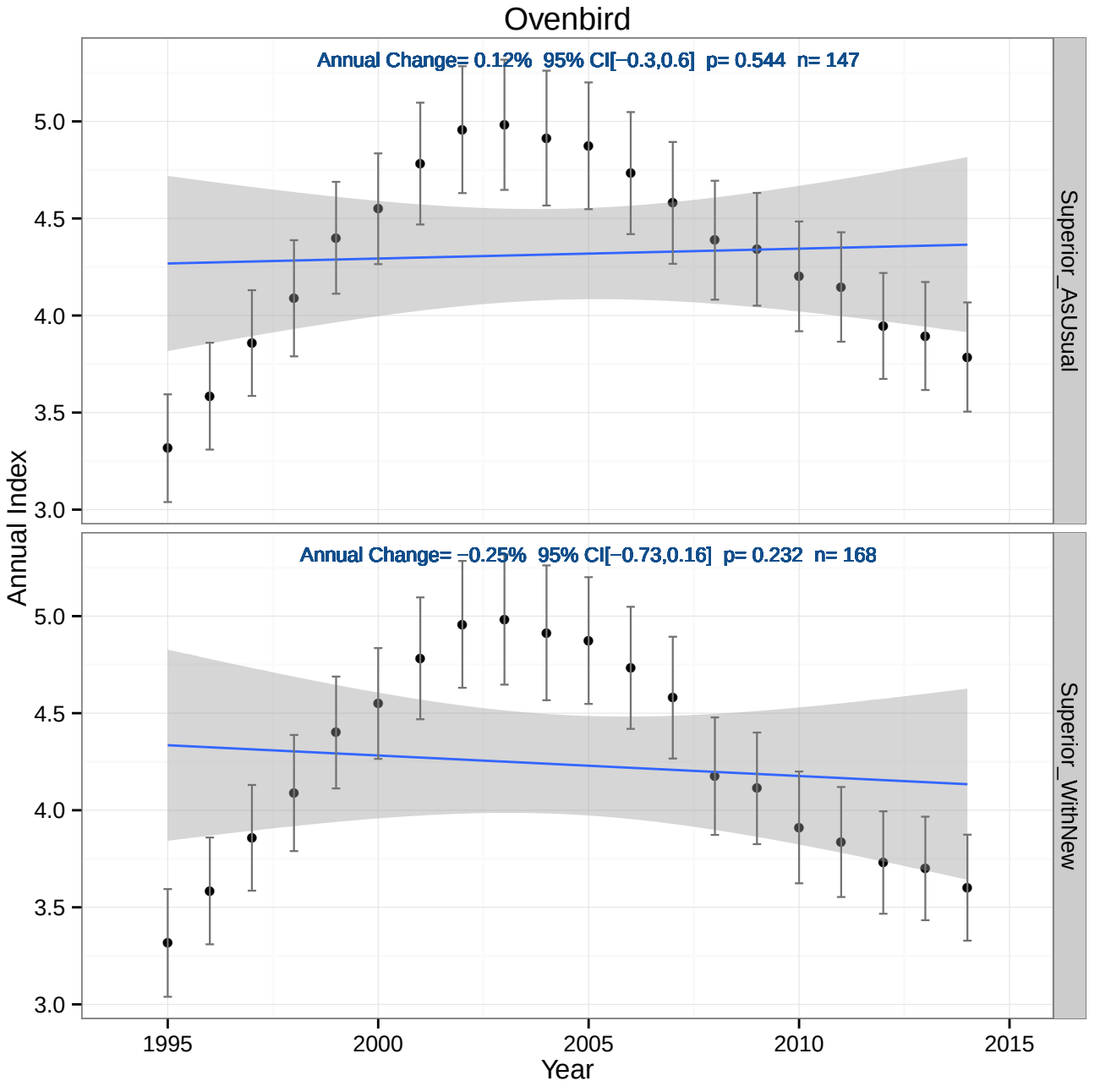

nest_ground
Annual Change= 0.4% 95% CI[0.17,0.61] p= 0 n= 147
Annual Change= 0.36% 95% CI[0.15,0.56] p= 0 n= 172
Superior_AsUsual
Superior_WithNew
Annual Index
Year
18
16
14
1995
2000
2005
2010
2015

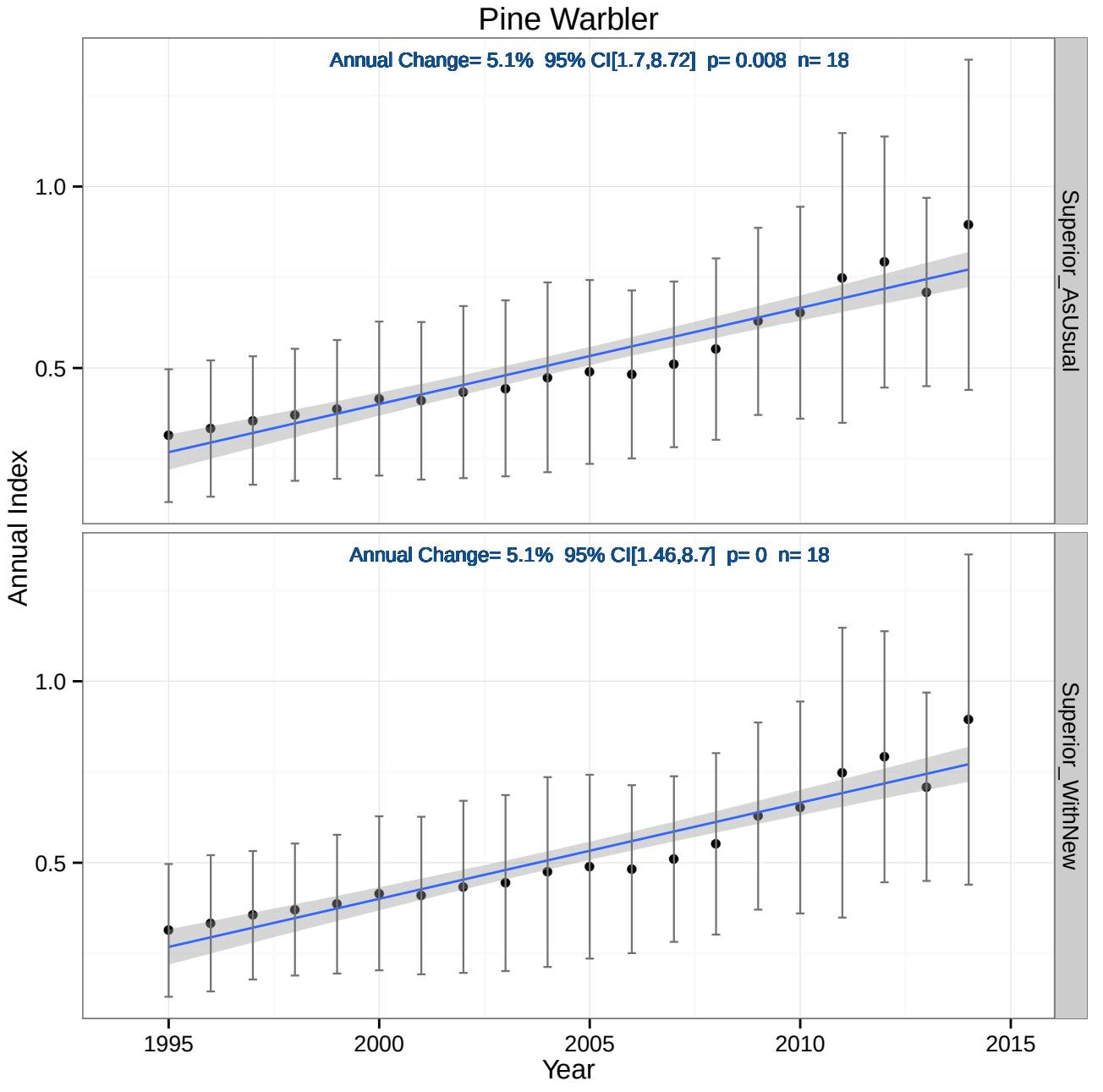

nest_shrub
Annual Change= −0.01% 95% CI[−0.4,0.39] p= 0.952 n= 147
Annual Change= −0.4% 95% CI[−0.83,0.01] p= 0.056 n= 172
Superior_AsUsual
Superior_WithNew
Annual Index
Year
10
9
8
7
6
1995
2000
2005
2010
2015

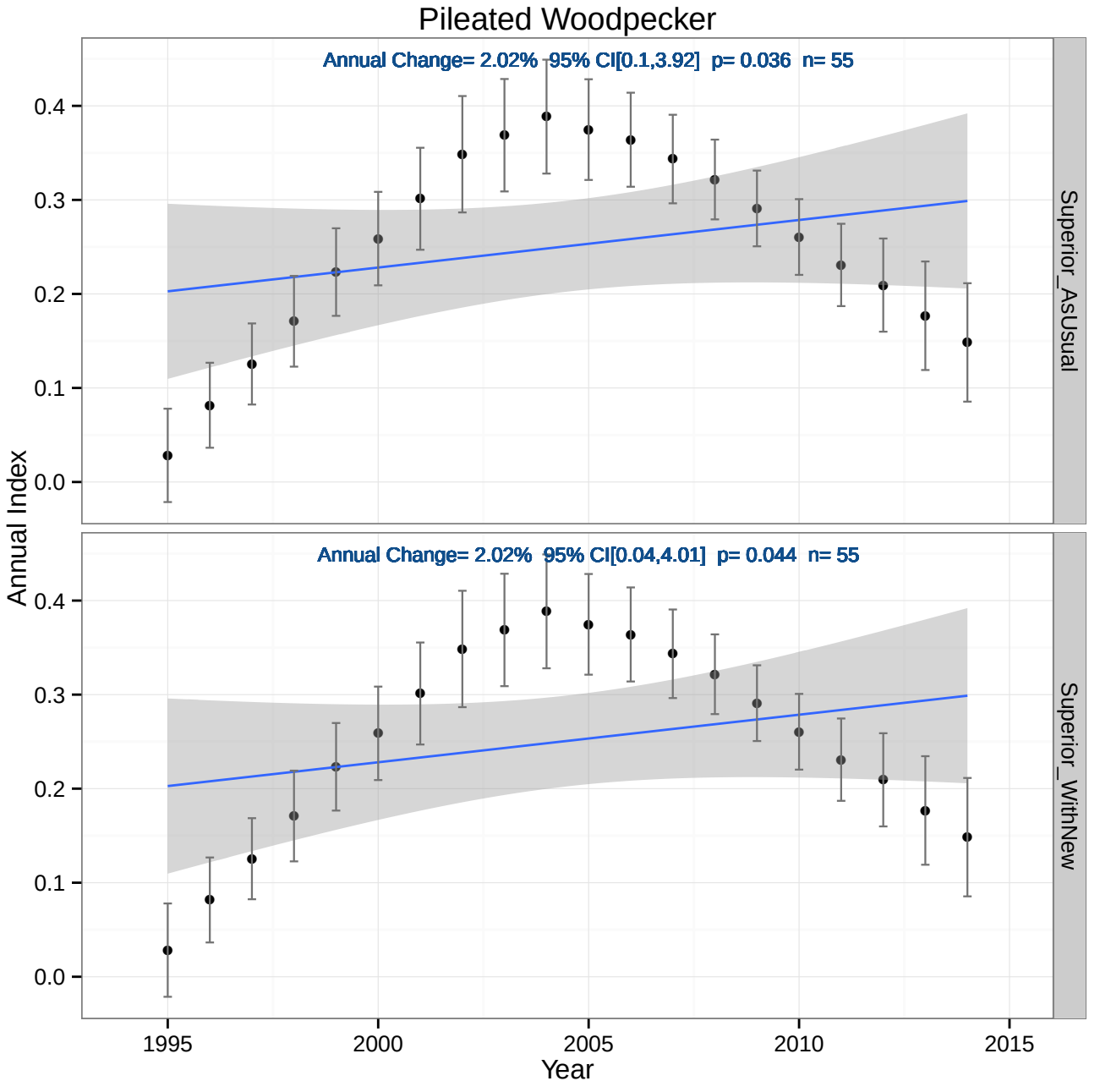

Northern Parula
Annual Change= 3.16% 95% CI[1.89,4.47] p= 0 n= 82
Annual Change= 3.11% 95% CI[1.92,4.36] p= 0 n= 86
Superior_AsUsual
Superior_WithNew
Annual Index
0.4
0.6
0.8
1995
2000
2005
2010
2015
Year

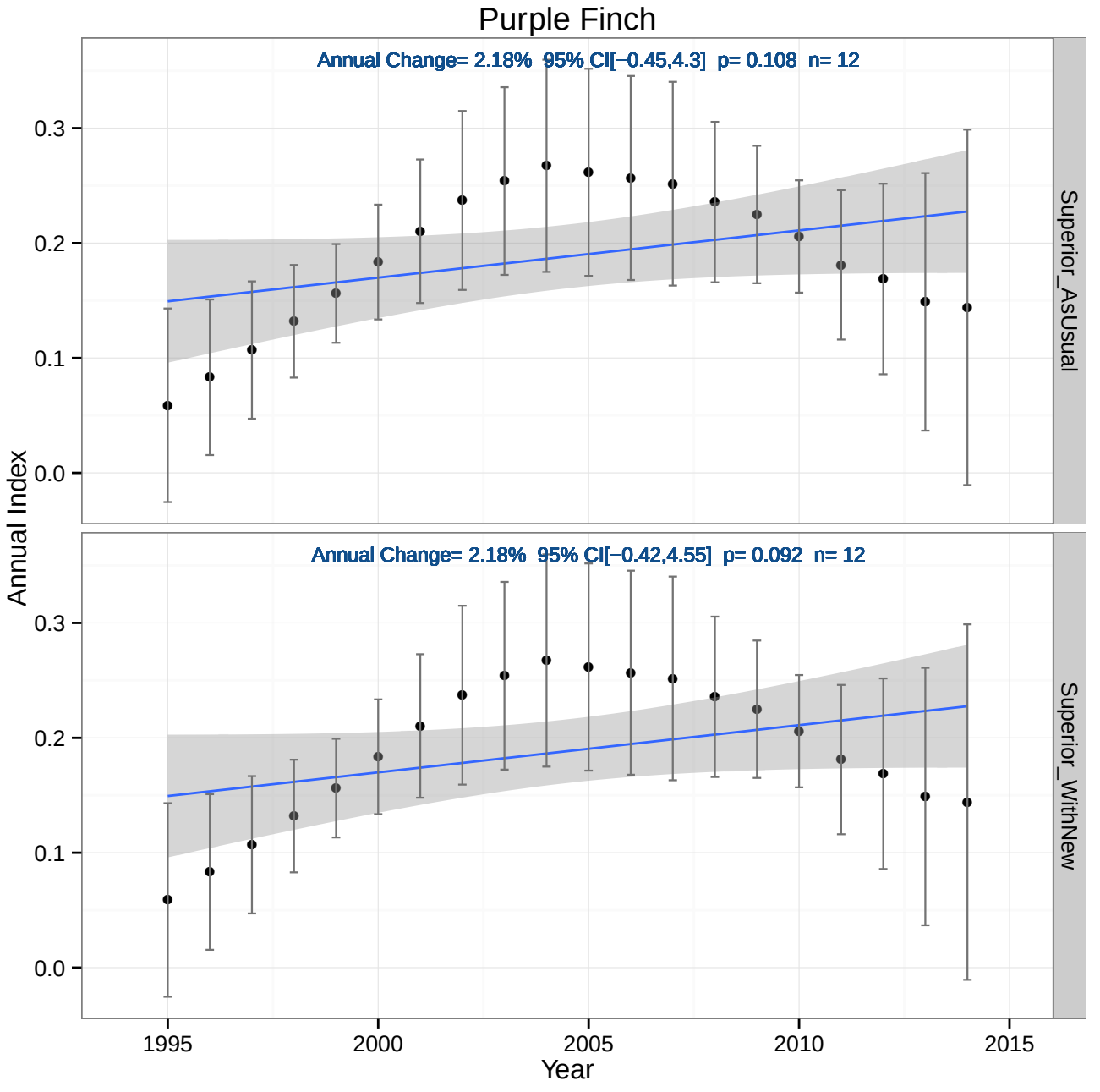

Northern Waterthrush
Annual Change= 2.09% 95% CI[−0.66,5.76] p= 0.148 n= 17
Annual Change= 3.11% 95% CI[0.35,6.56] p= 0.02 n= 20
Superior_AsUsual
Superior_WithNew
Annual Index
1.00
0.75
0.50
0.25
1995
2000
2005
2010
2015
Year

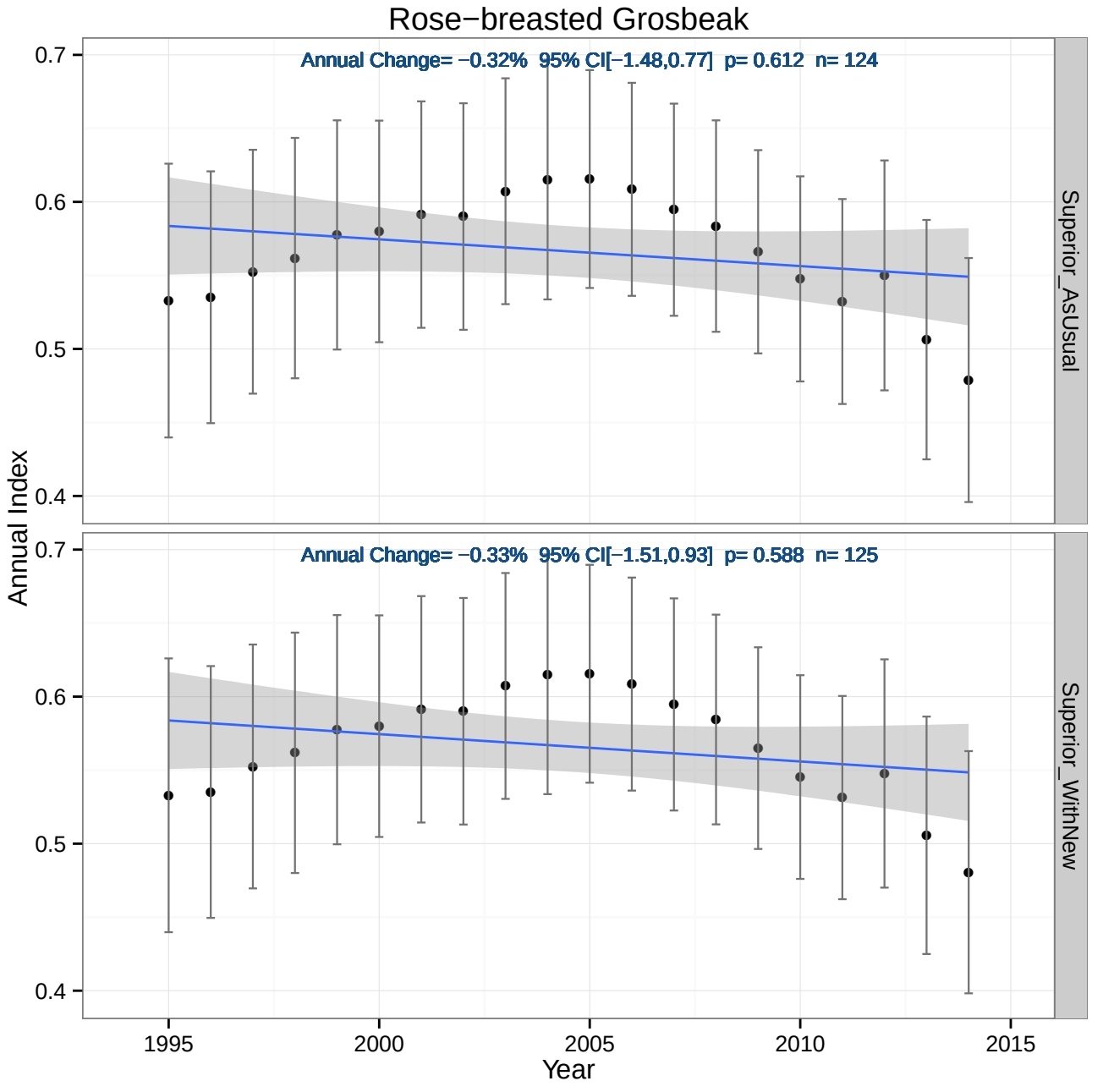

Olive−sided Flycatcher
Annual Change= −2.66% 95% CI[−6.6,−0.04] p= 0.044 n= 5
Annual Change= −2.66% 95% CI[−6.83,−0.14] p= 0.028 n= 5
Superior_AsUsual
Superior_WithNew
Annual Index
0.50
0.25
0.00
−0.25
1995
2000
2005
2010
2015
Year

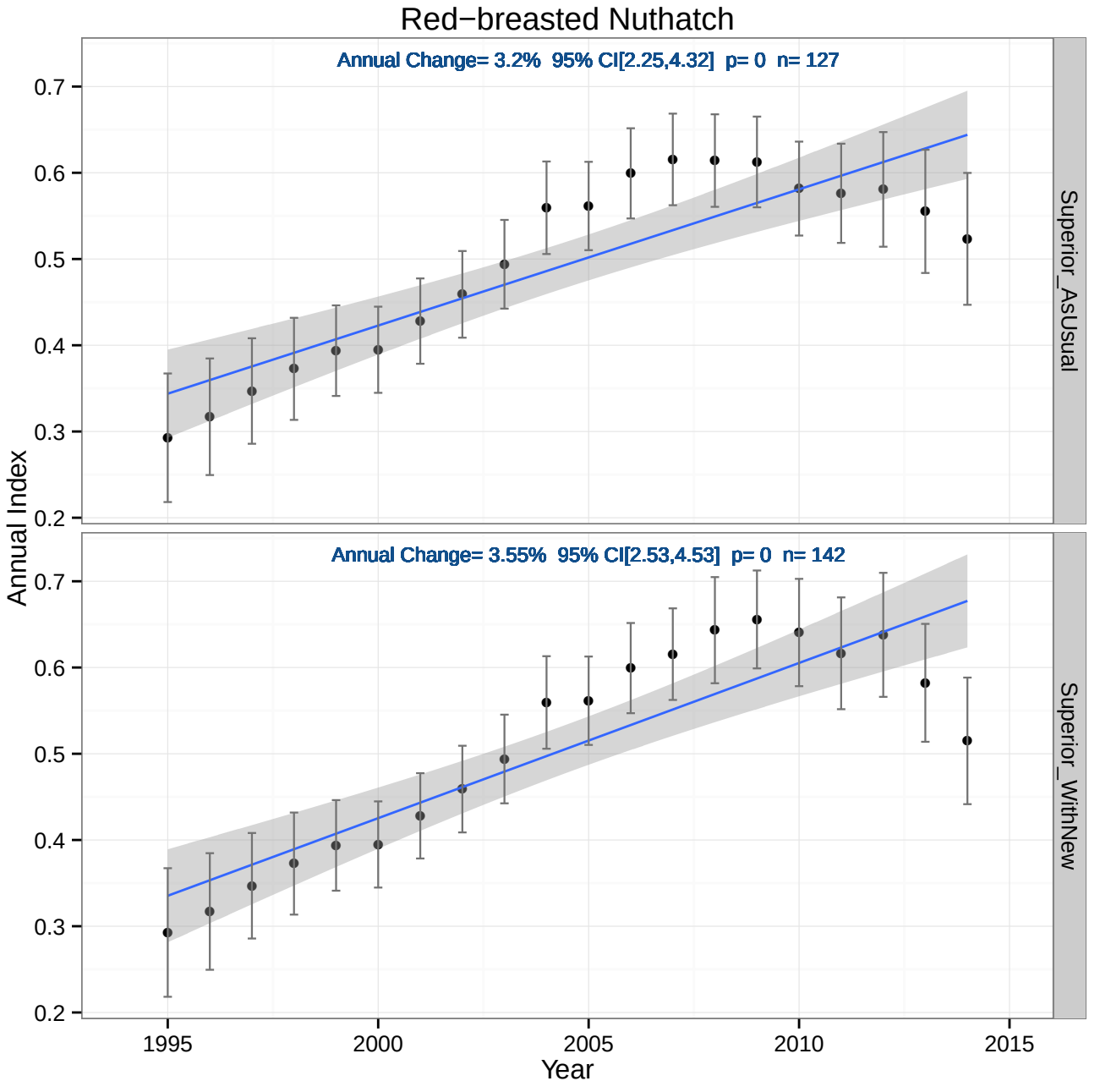

Ovenbird
Annual Change= 0.12% 95% CI[−0.3,0.6] p= 0.544 n= 147
Annual Change= −0.25% 95% CI[−0.73,0.16] p= 0.232 n= 168
Superior_AsUsual
Superior_WithNew
Annual Index
Year
5.0
4.5
4.0
3.5
3.0
1995
2000
2005
2010
2015

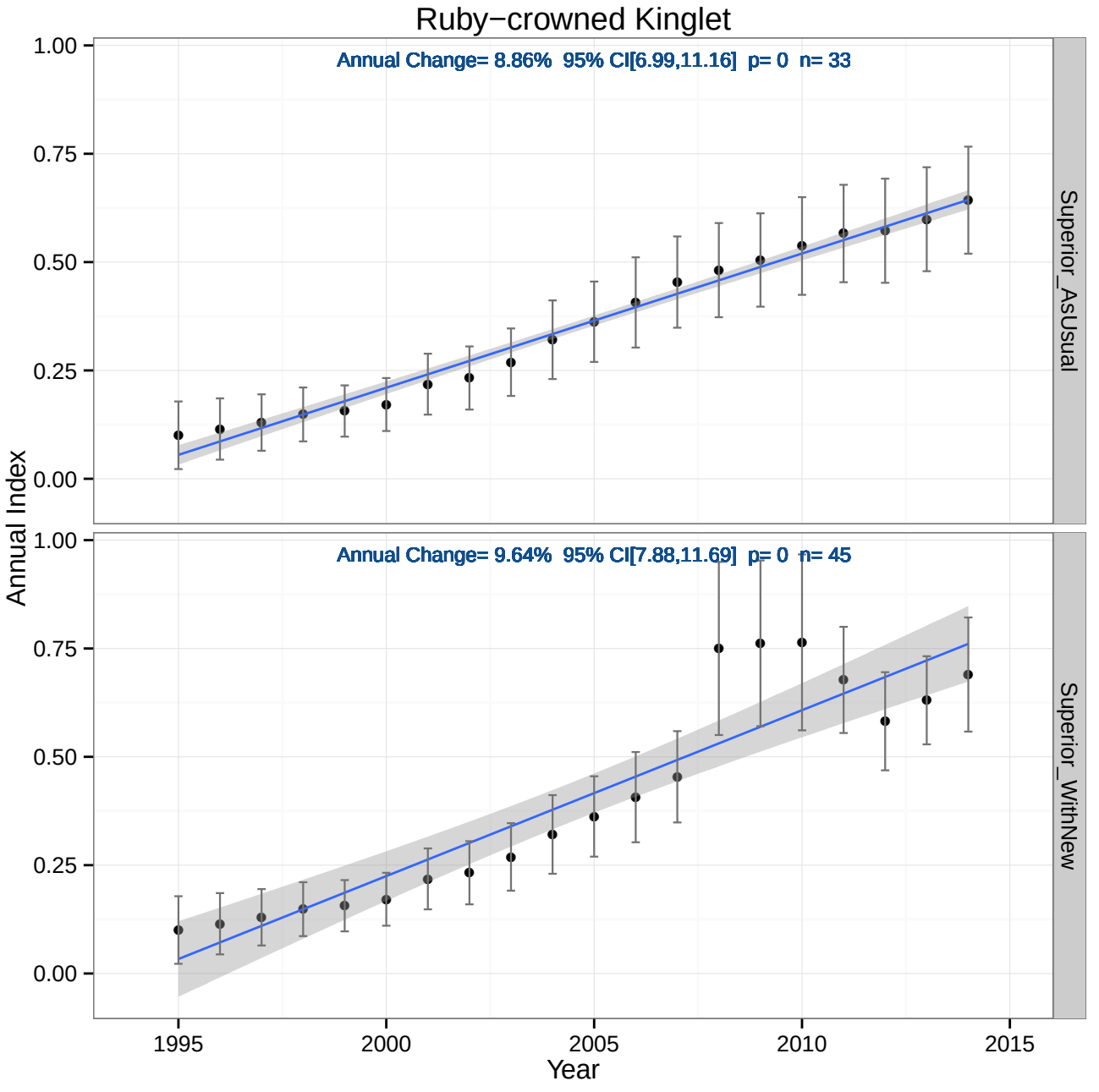

Pine Warbler
Annual Change= 5.1% 95% CI[1.7,8.72] p= 0.008 n= 18
Annual Change= 5.1% 95% CI[1.46,8.7] p= 0 n= 18
Superior_AsUsual
Superior_WithNew
Annual Index
1.0
0.5
1995
2000
2005
2010
2015
Year

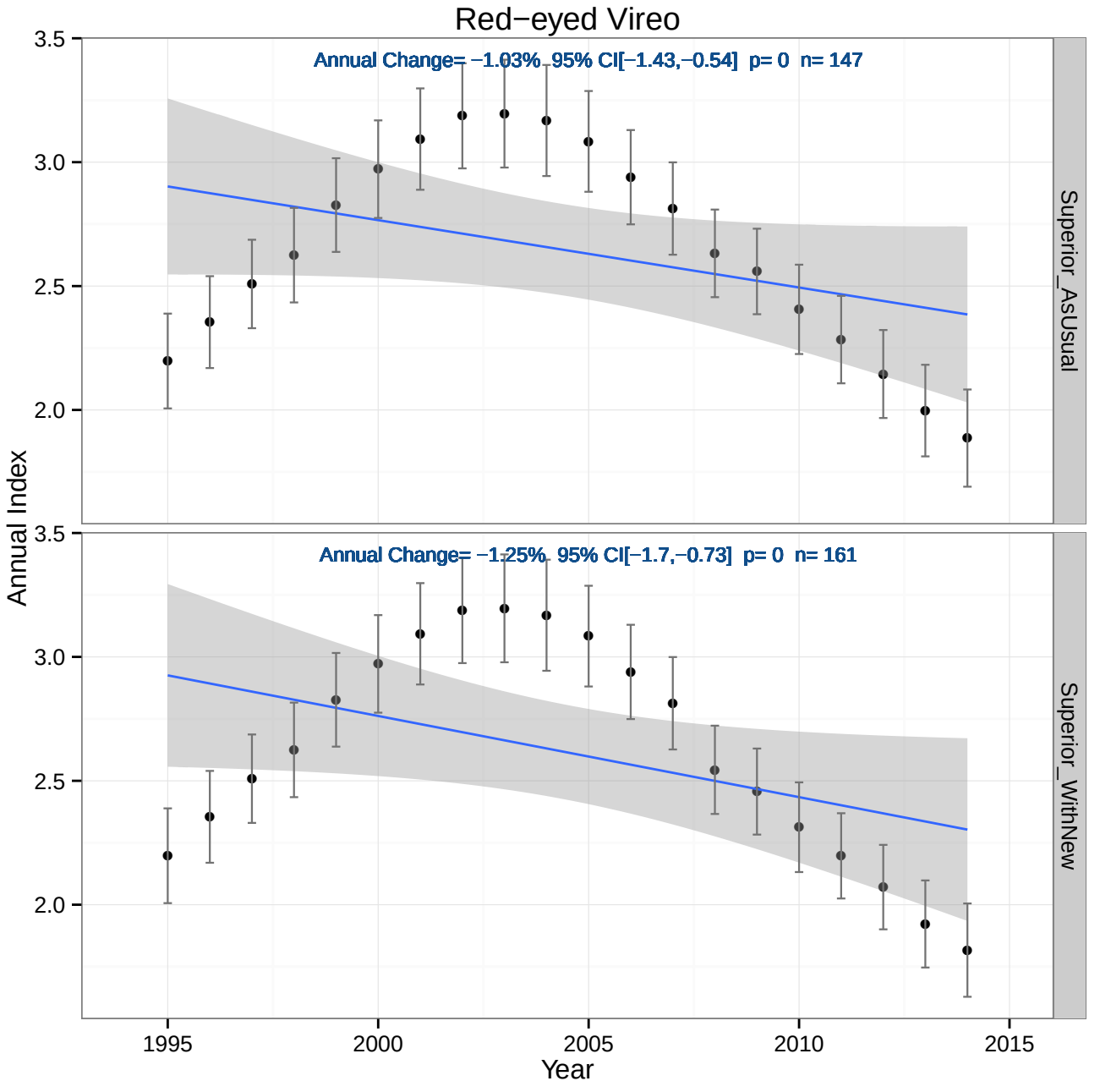

Pileated Woodpecker
Annual Change= 2.02% 95% CI[0.1,3.92] p= 0.036 n= 55
Annual Change= 2.02% 95% CI[0.04,4.01] p= 0.044 n= 55
Superior_AsUsual
Superior_WithNew
Annual Index
0.0
0.1
0.2
0.3
0.4
1995
2000
2005
2010
2015
Year

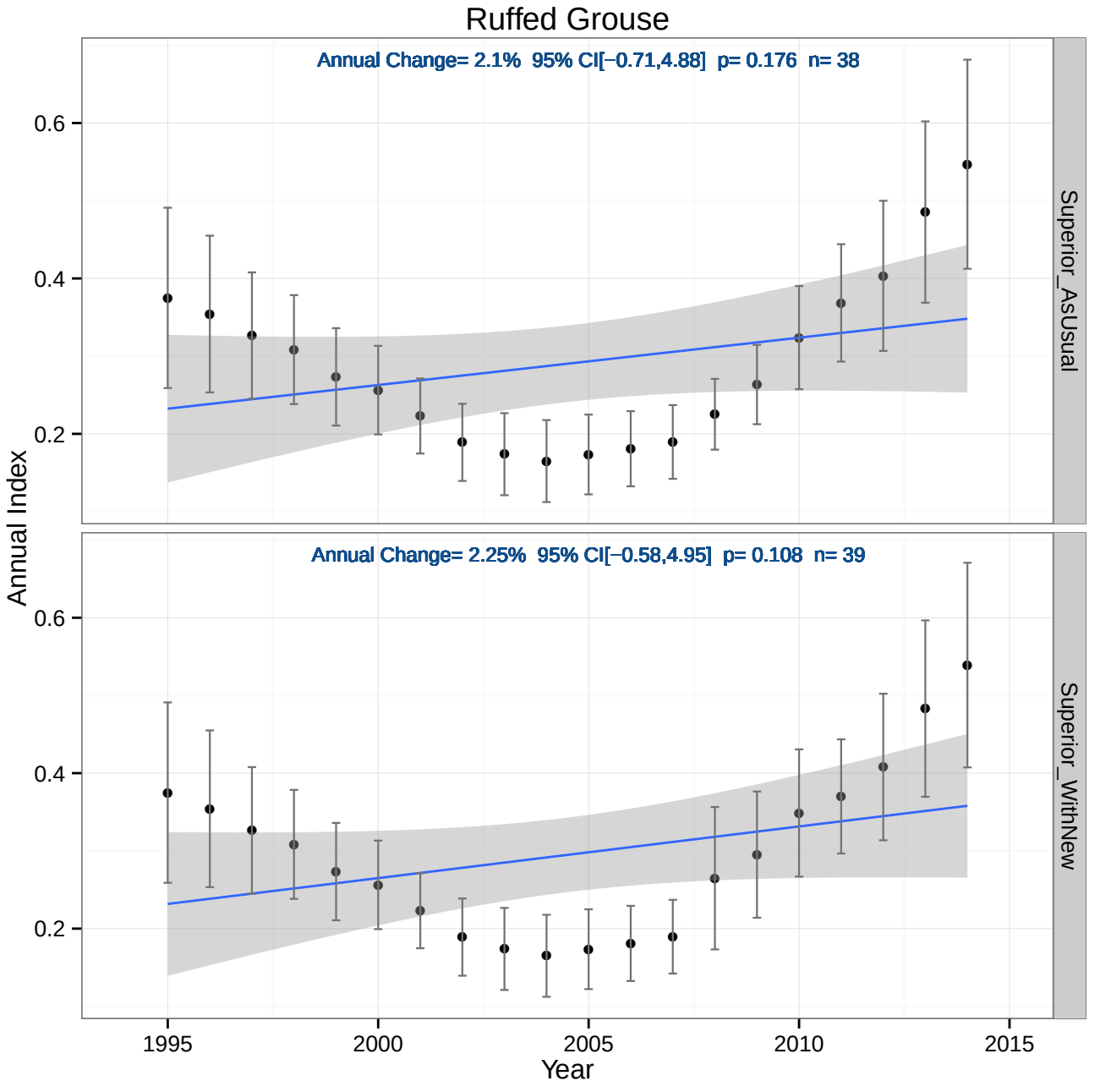

Purple Finch
Annual Change= 2.18% 95% CI[−0.45,4.3] p= 0.108 n= 12
Annual Change= 2.18% 95% CI[−0.42,4.55] p= 0.092 n= 12
Superior_AsUsual
Superior_WithNew
Annual Index
0.0
0.1
0.2
0.3
1995
2000
2005
2010
2015
Year

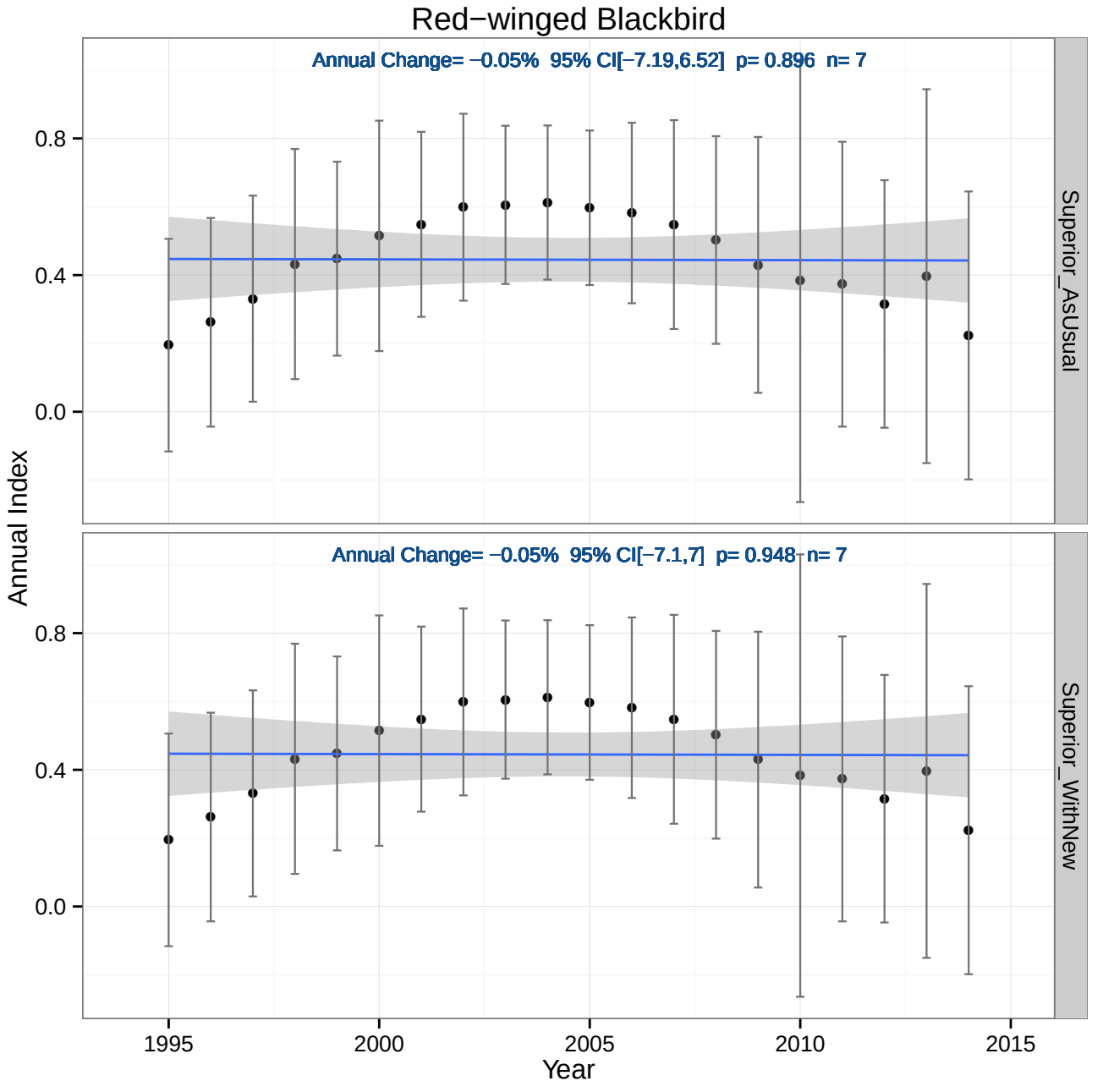

Rose−breasted Grosbeak
Annual Change= −0.32% 95% CI[−1.48,0.77] p= 0.612 n= 124
Annual Change= −0.33% 95% CI[−1.51,0.93] p= 0.588 n= 125
Superior_AsUsual
Superior_WithNew
Annual Index
Year
0.7
0.6
0.5
0.4
1995
2000
2005
2010
2015

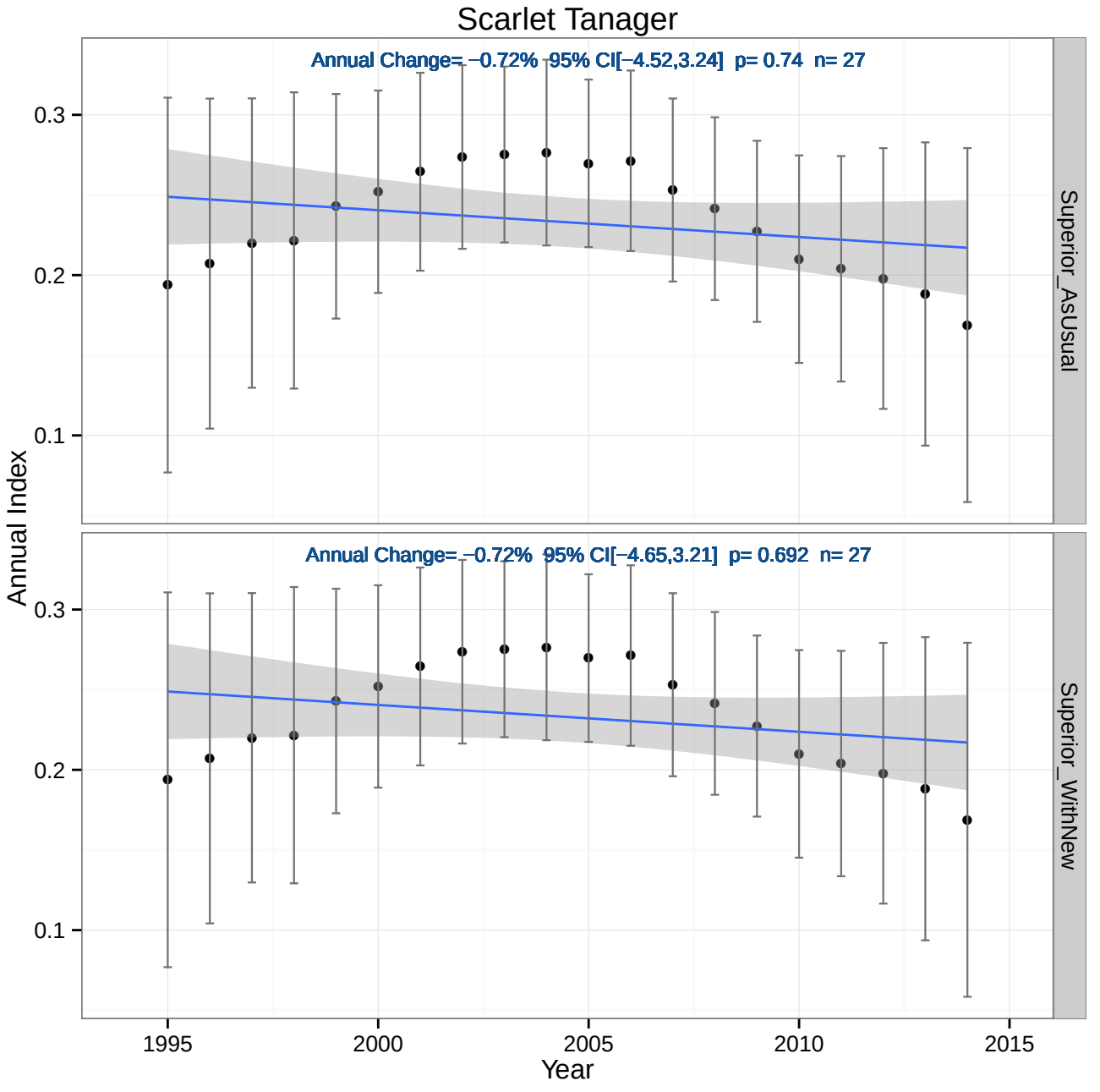

Red−breasted Nuthatch
Annual Change= 3.2% 95% CI[2.25,4.32] p= 0 n= 127
Annual Change= 3.55% 95% CI[2.53,4.53] p= 0 n= 142
Superior_AsUsual
Superior_WithNew
Annual Index
0.2
0.3
0.4
0.5
0.6
0.7
1995
2000
2005
2010
2015
Year

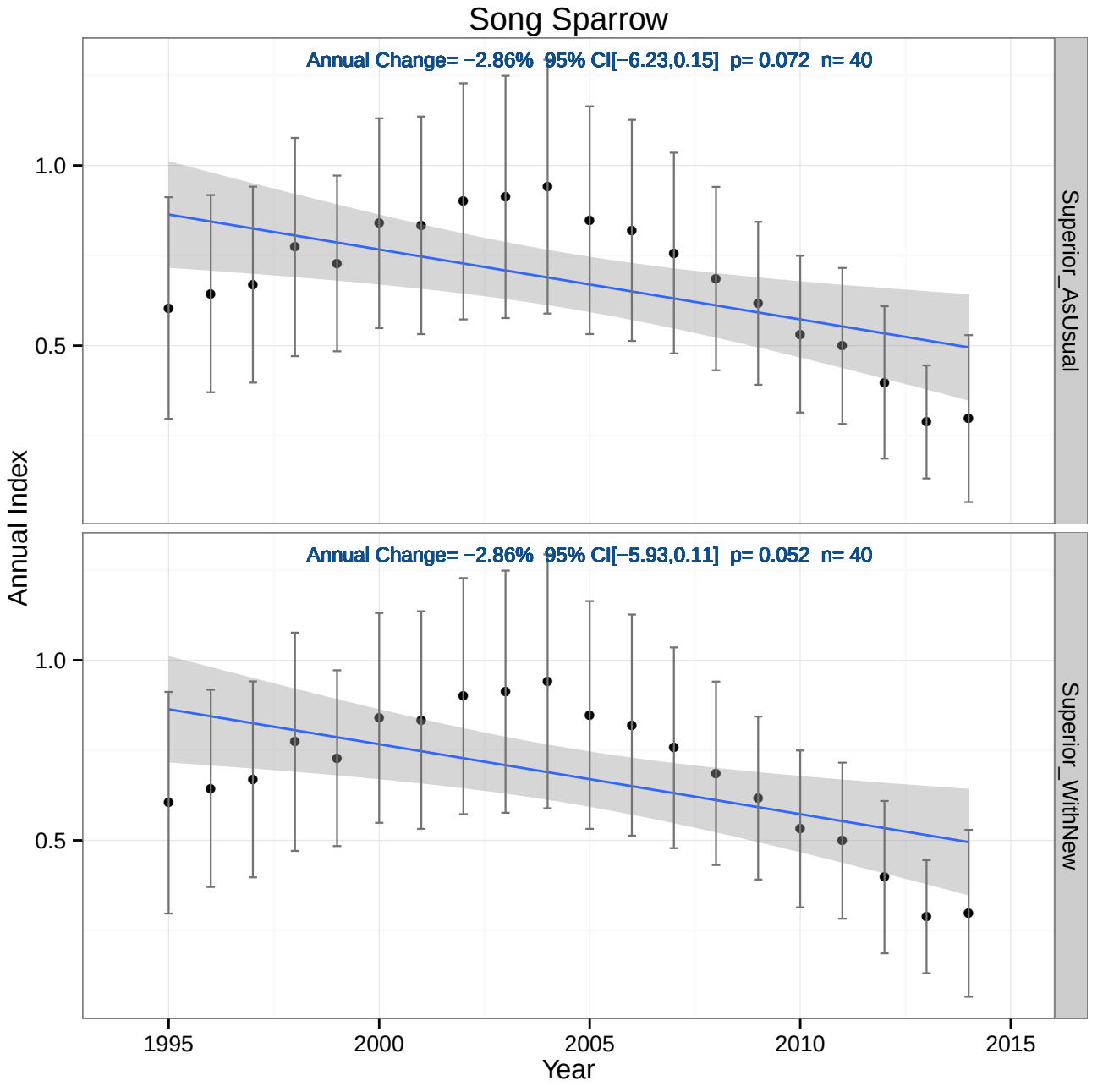

Ruby−crowned Kinglet
Annual Change= 8.86% 95% CI[6.99,11.16] p= 0 n= 33
Annual Change= 9.64% 95% CI[7.88,11.69] p= 0 n= 45
Superior_AsUsual
Superior_WithNew
Annual Index
Year
1.00
0.75
0.50
0.25
0.00
1995
2000
2005
2010
2015

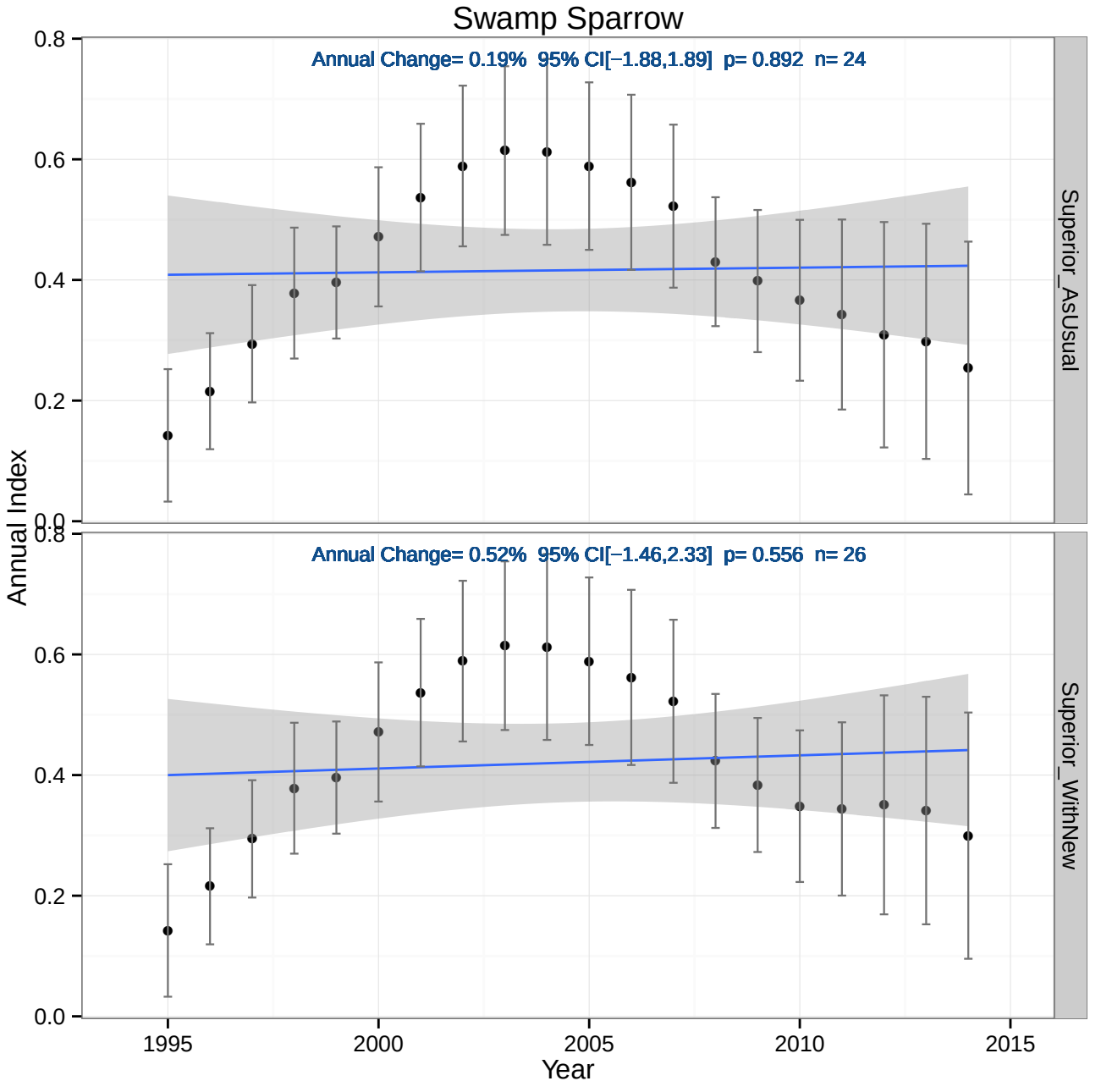

Red−eyed Vireo
Annual Change= −1.03% 95% CI[−1.43,−0.54] p= 0 n= 147
Annual Change= −1.25% 95% CI[−1.7,−0.73] p= 0 n= 161
Superior_AsUsual
Superior_WithNew
Annual Index
Year
3.5
3.0
2.5
2.0
1995
2000
2005
2010
2015

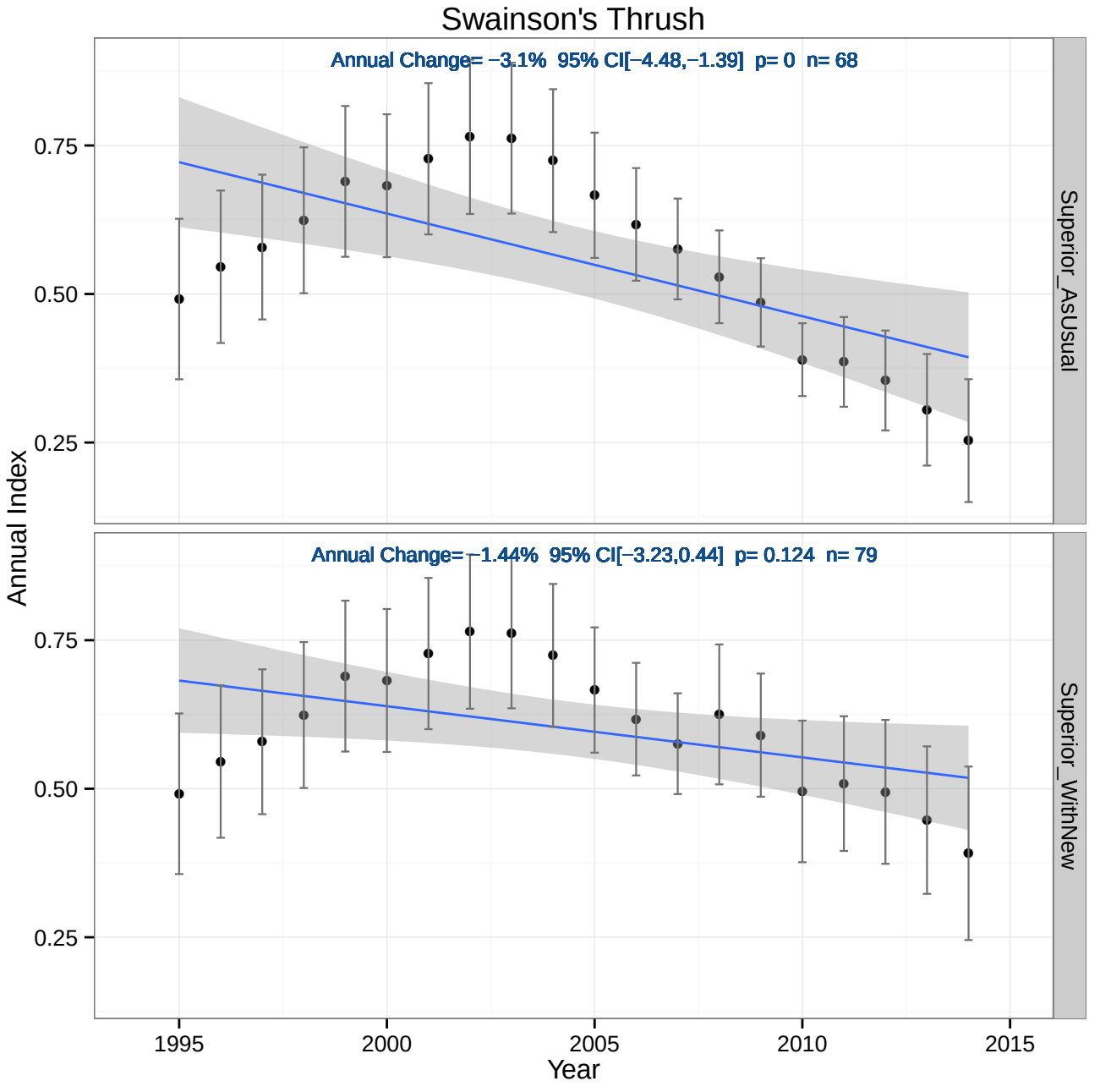

Ruffed Grouse
Annual Change= 2.1% 95% CI[−0.71,4.88] p= 0.176 n= 38
Annual Change= 2.25% 95% CI[−0.58,4.95] p= 0.108 n= 39
Superior_AsUsual
Superior_WithNew
Annual Index
0.2
0.4
0.6
1995
2000
2005
2010
2015
Year

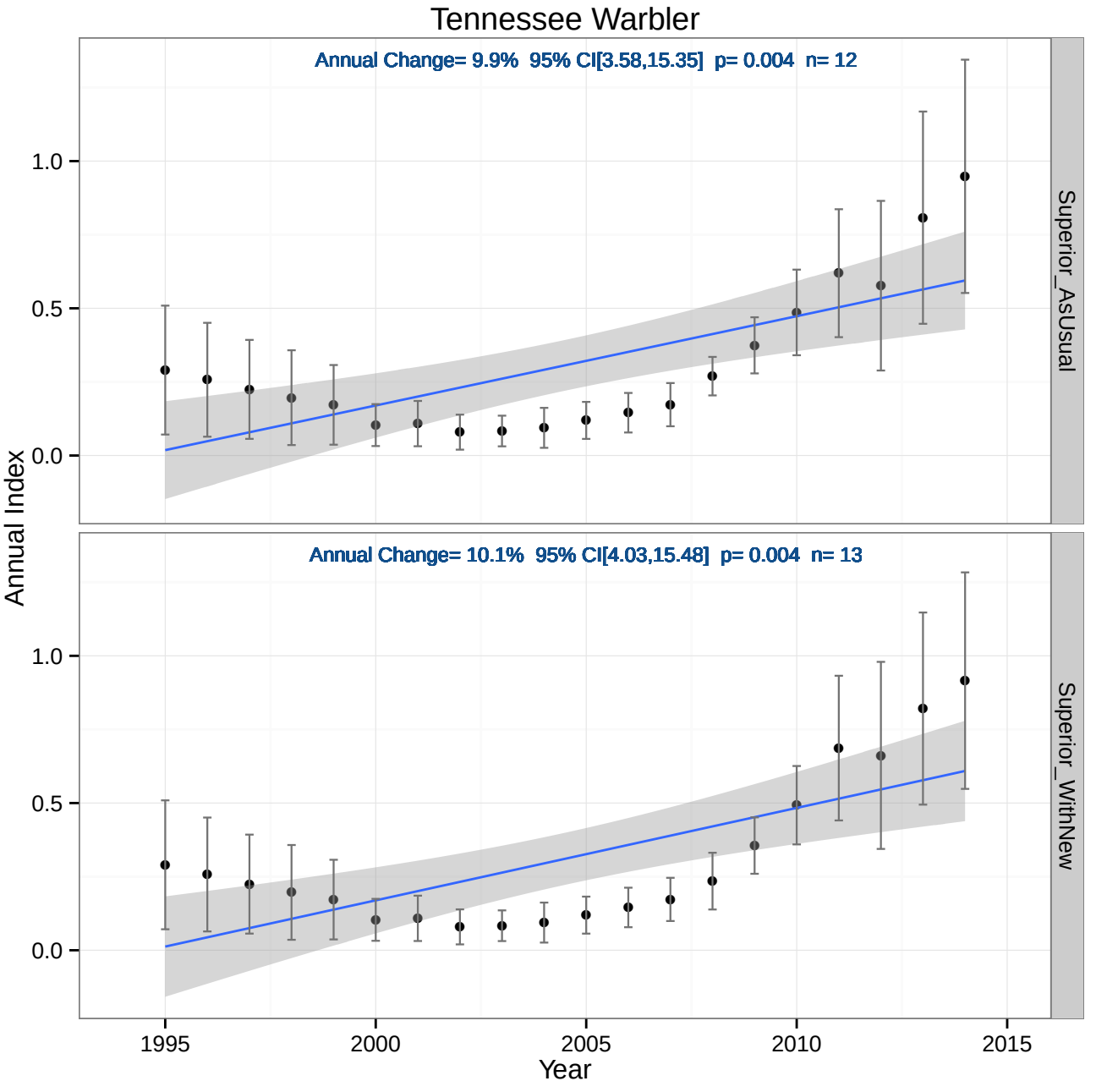

Red−winged Blackbird
Annual Change= −0.05% 95% CI[−7.19,6.52] p= 0.896 n= 7
Annual Change= −0.05% 95% CI[−7.1,7] p= 0.948 n= 7
Superior_AsUsual
Superior_WithNew
Annual Index
0.0
0.4
0.8
1995
2000
2005
2010
2015
Year

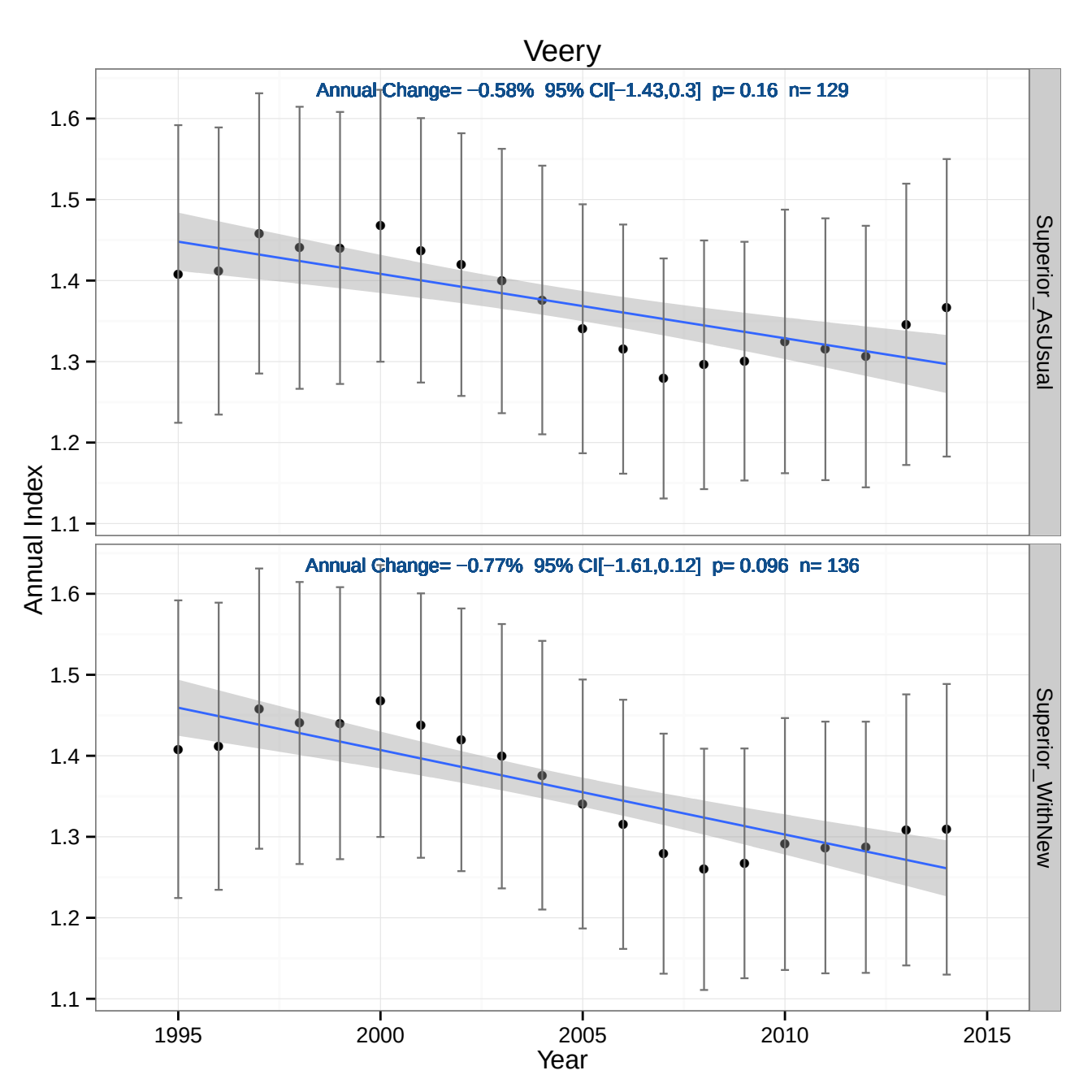

Scarlet Tanager
Annual Change= −0.72% 95% CI[−4.52,3.24] p= 0.74 n= 27
Annual Change= −0.72% 95% CI[−4.65,3.21] p= 0.692 n= 27
Superior_AsUsual
Superior_WithNew
Annual Index
0.3
0.2
0.1
1995
2000
2005
2010
2015
Year

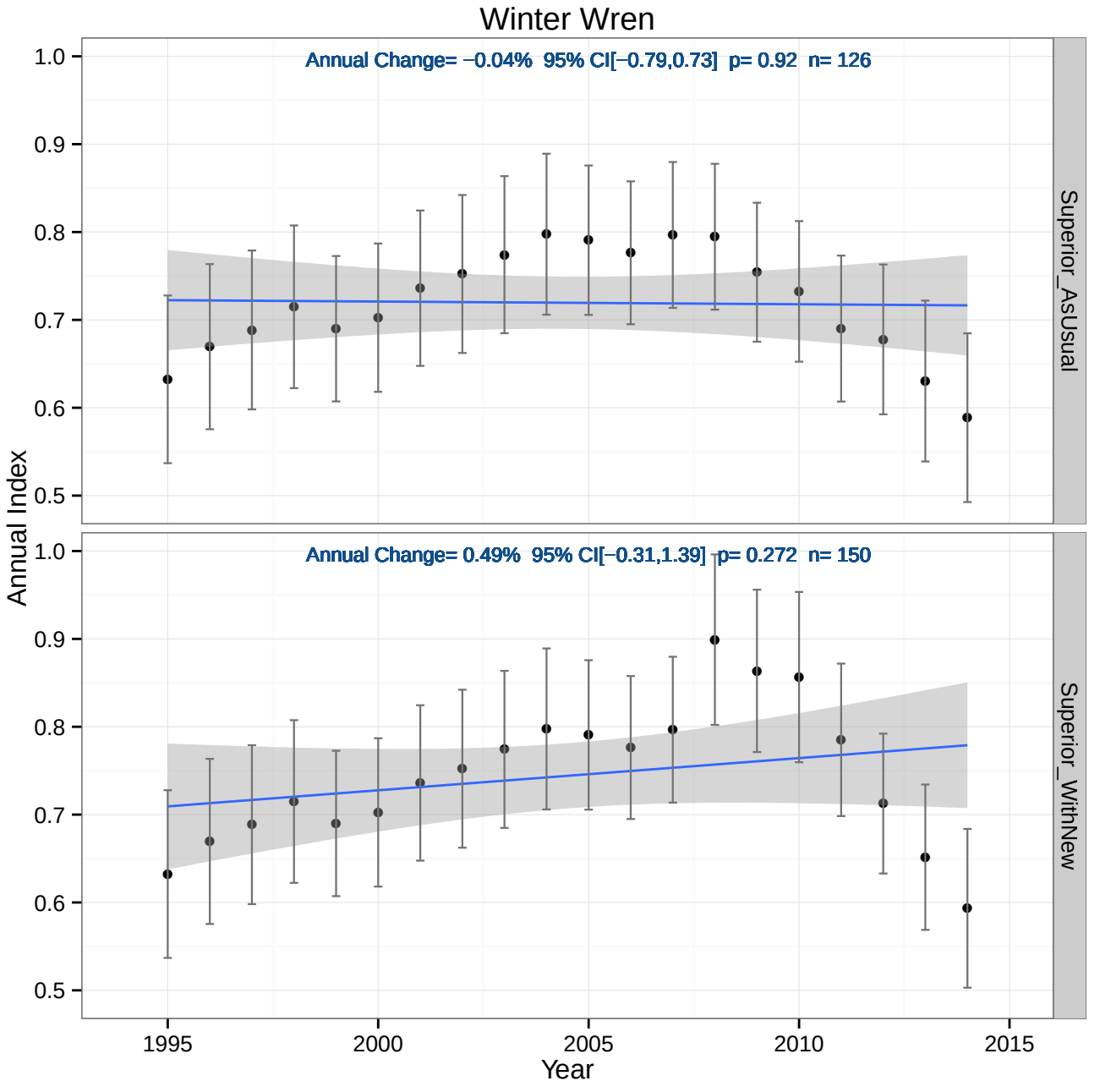

Song Sparrow
Annual Change= −2.86% 95% CI[−6.23,0.15] p= 0.072 n= 40
Annual Change= −2.86% 95% CI[−5.93,0.11] p= 0.052 n= 40
Superior_AsUsual
Superior_WithNew
Annual Index
1.0
0.5
1995
2000
2005
2010
2015
Year

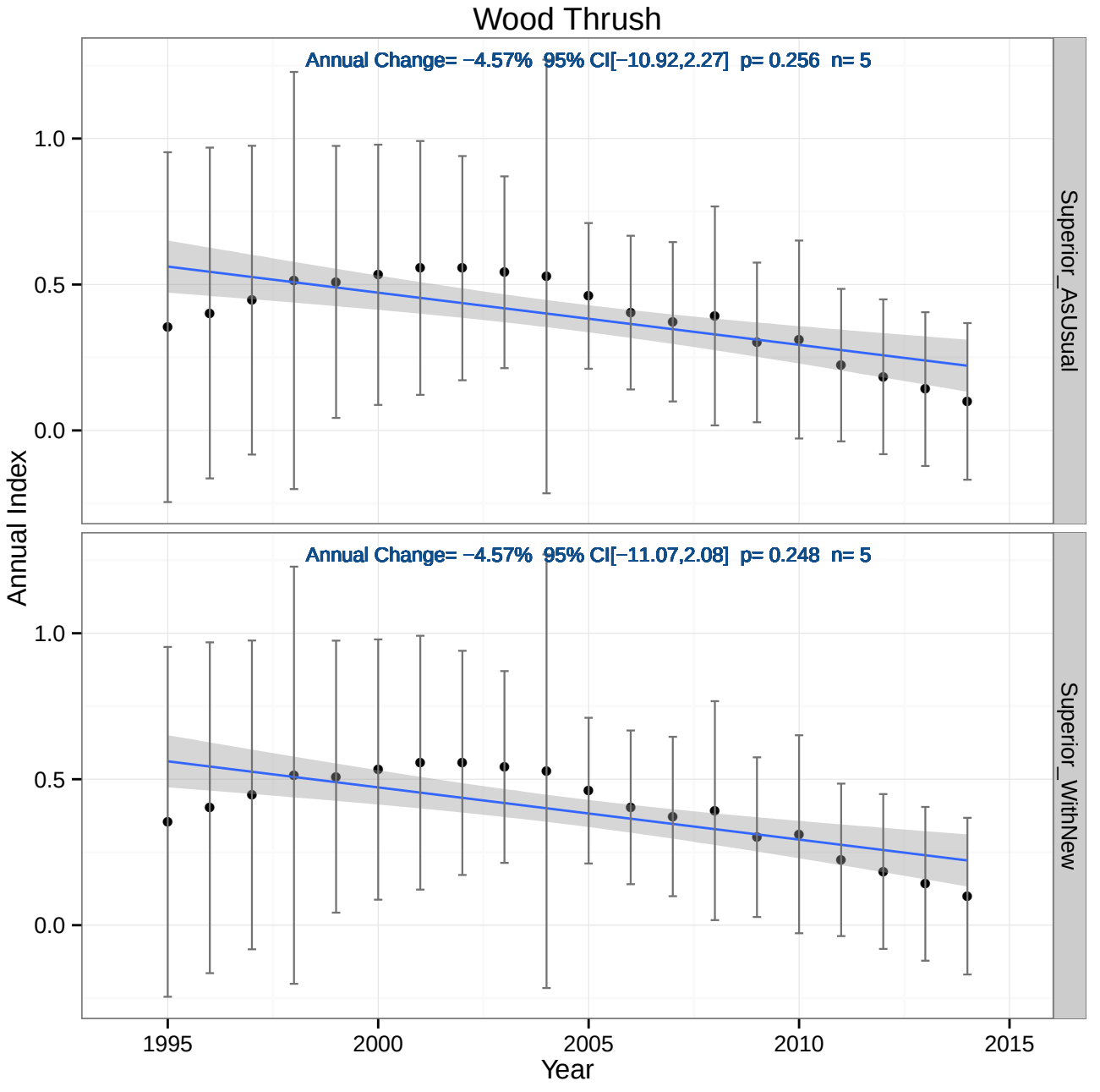

Swamp Sparrow
Annual Change= 0.19% 95% CI[−1.88,1.89] p= 0.892 n= 24
Annual Change= 0.52% 95% CI[−1.46,2.33] p= 0.556 n= 26
Superior_AsUsual
Superior_WithNew
Annual Index
Year
0.0
0.2
0.4
0.6
0.8
1995
2000
2005
2010
2015

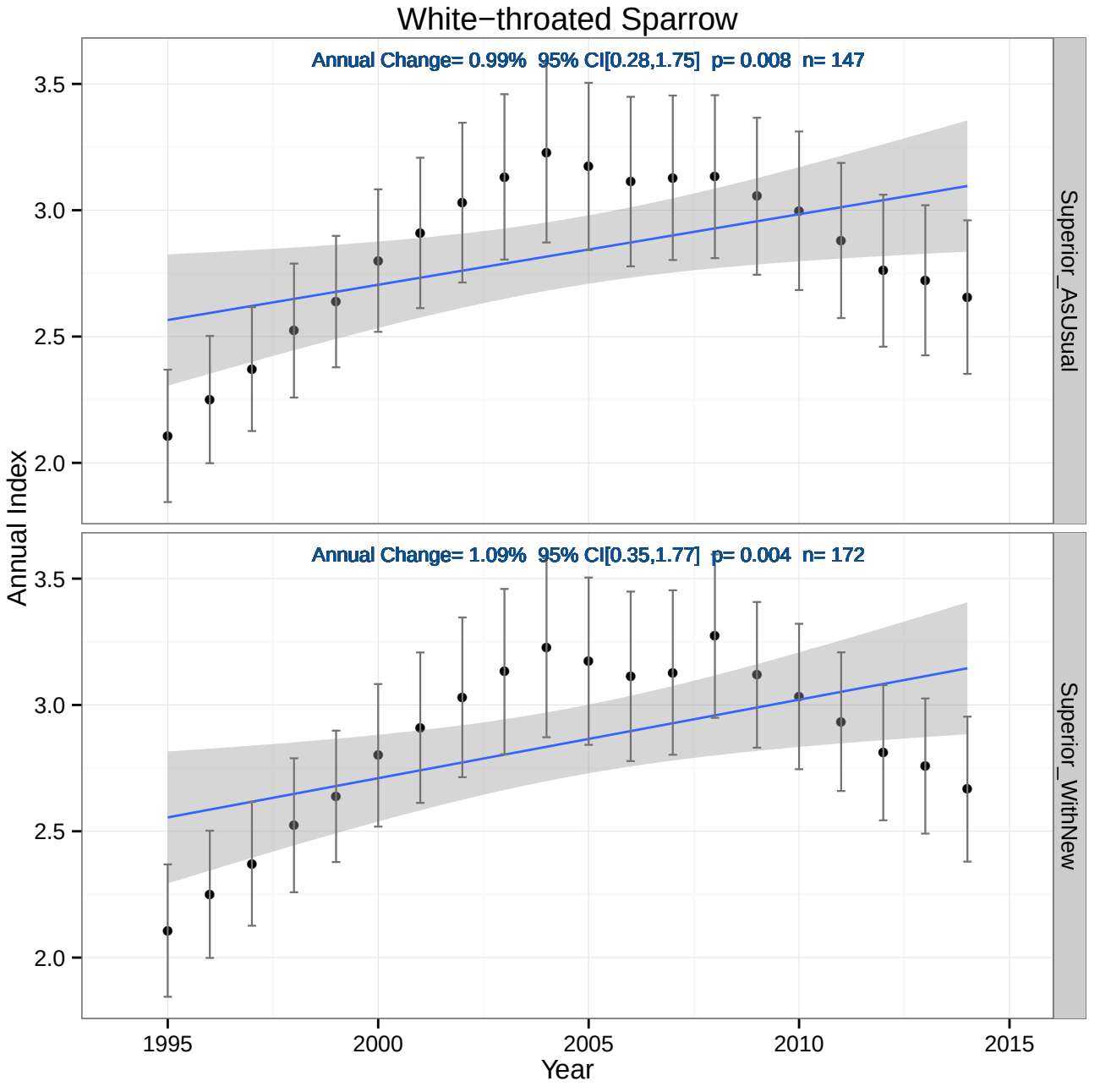

Swainson's Thrush
Annual Change= −3.1% 95% CI[−4.48,−1.39] p= 0 n= 68
Annual Change= −1.44% 95% CI[−3.23,0.44] p= 0.124 n= 79
Superior_AsUsual
Superior_WithNew
Annual Index
0.75
0.50
0.25
1995
2000
2005
2010
2015
Year

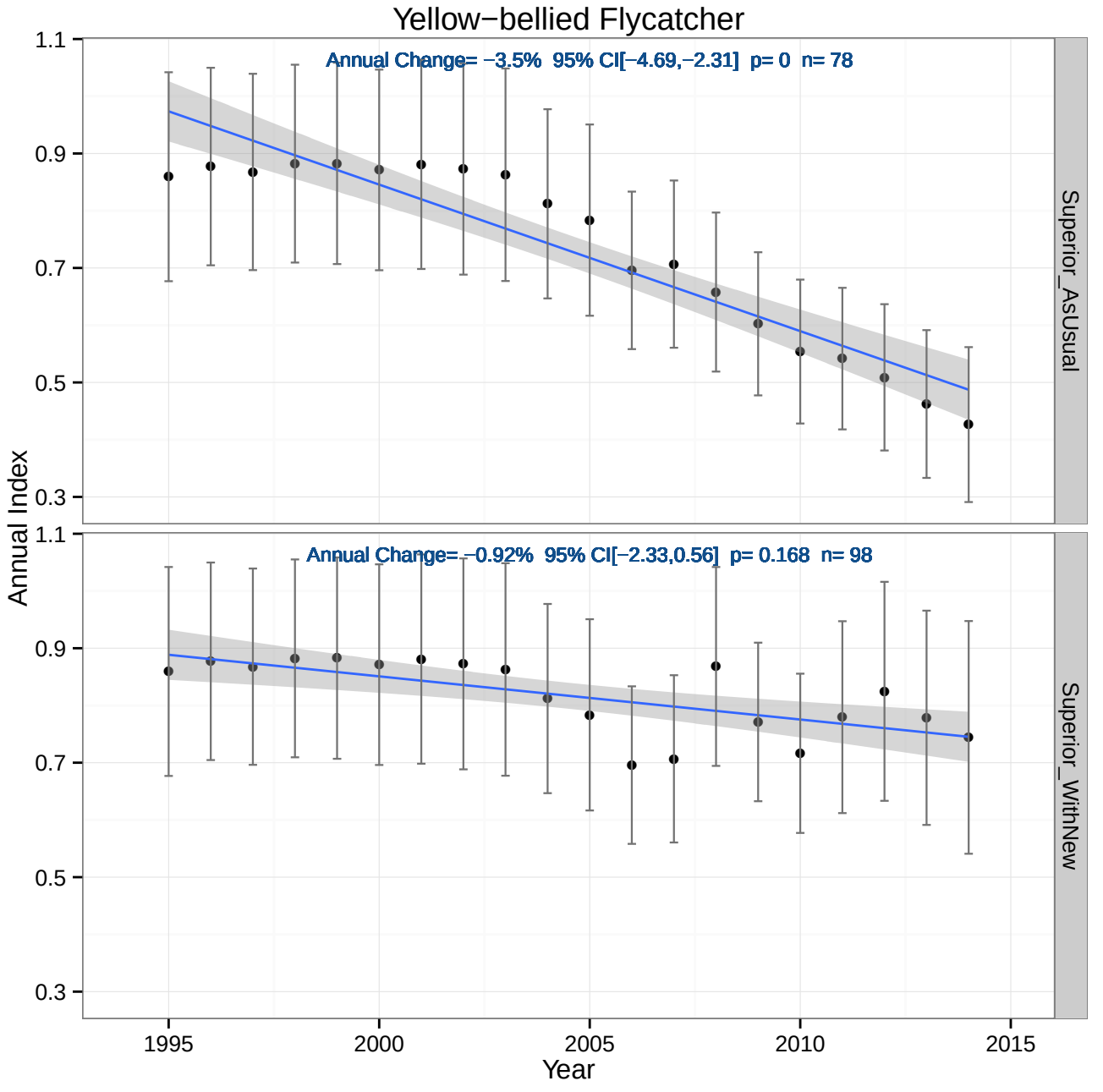

Tennessee Warbler
Annual Change= 9.9% 95% CI[3.58,15.35] p= 0.004 n= 12
Annual Change= 10.1% 95% CI[4.03,15.48] p= 0.004 n= 13
Superior_AsUsual
Superior_WithNew
Annual Index
Year
0.0
0.5
1.0
1995
2000
2005
2010
2015

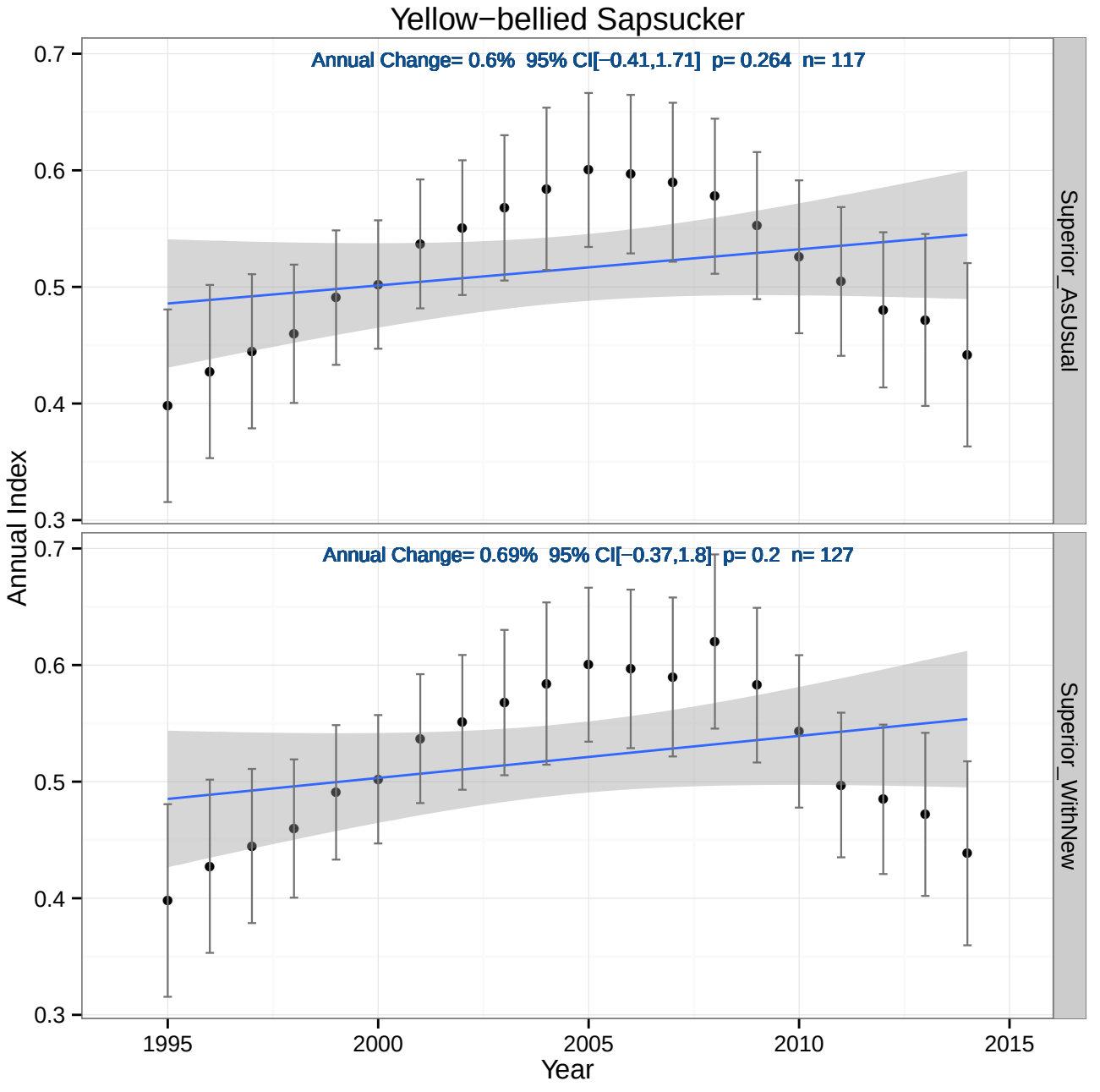

Veery
Annual Change= −0.58% 95% CI[−1.43,0.3] p= 0.16 n= 129
Annual Change= −0.77% 95% CI[−1.61,0.12] p= 0.096 n= 136
Superior_AsUsual
Superior_WithNew
Annual Index
Year
1.1
1.2
1.3
1.4
1.5
1.6
1995
2000
2005
2010
2015

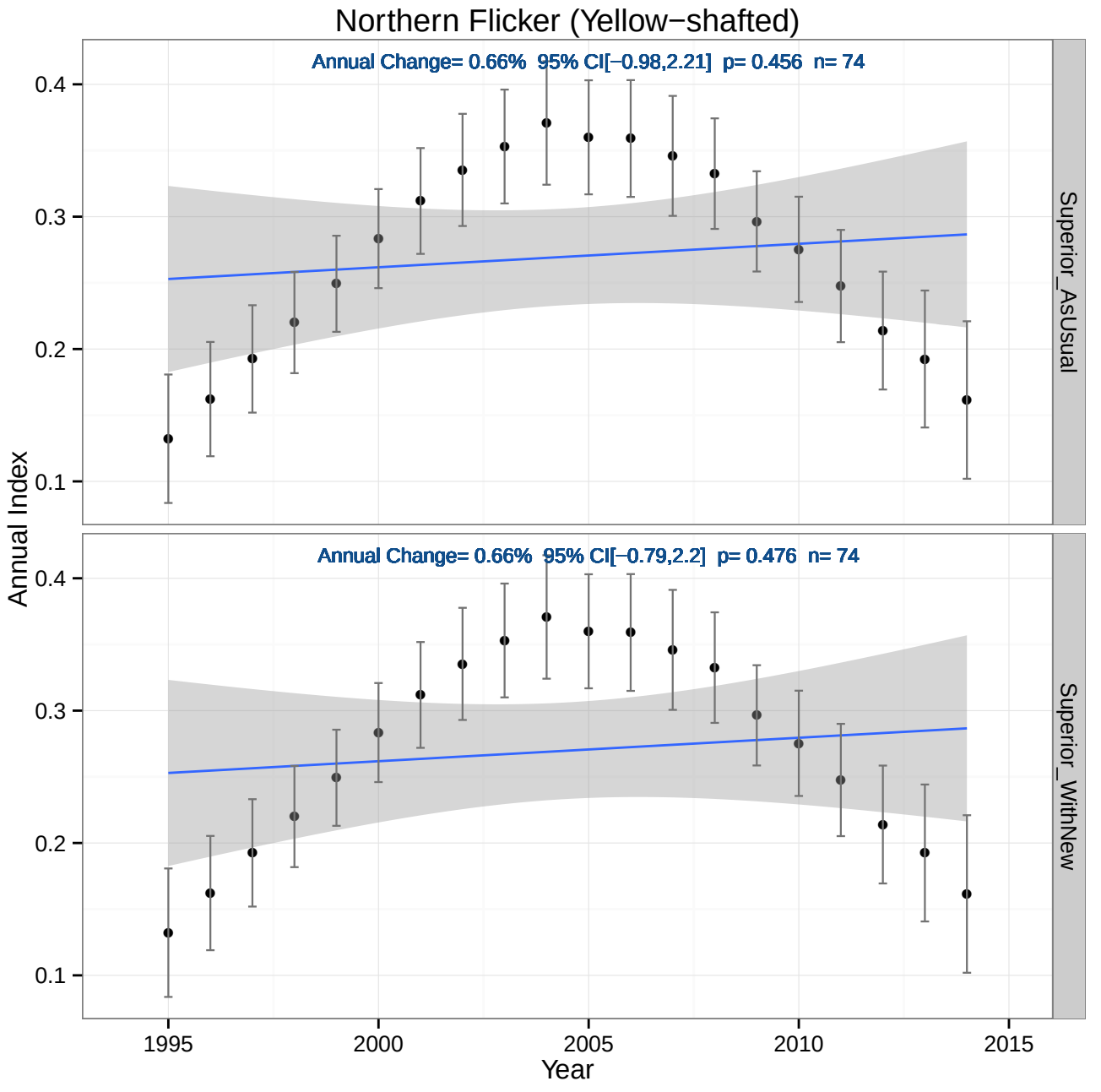

Winter Wren
Annual Change= −0.04% 95% CI[−0.79,0.73] p= 0.92 n= 126
Annual Change= 0.49% 95% CI[−0.31,1.39] p= 0.272 n= 150
Superior_AsUsual
Superior_WithNew
Annual Index
Year
1.0
0.9
0.8
0.7
0.6
0.5
1995
2000
2005
2010
2015


Wood Thrush
Annual Change= −4.57% 95% CI[−10.92,2.27] p= 0.256 n= 5
Annual Change= −4.57% 95% CI[−11.07,2.08] p= 0.248 n= 5
Superior_AsUsual
Superior_WithNew
Annual Index
1.0
0.5
0.0
1995
2000
2005
2010
2015
Year


White−throated Sparrow
Annual Change= 0.99% 95% CI[0.28,1.75] p= 0.008 n= 147
Annual Change= 1.09% 95% CI[0.35,1.77] p= 0.004 n= 172
Superior_AsUsual
Superior_WithNew
Annual Index
Year
3.5
3.0
2.5
2.0
1995
2000
2005
2010
2015


Yellow−bellied Flycatcher
Annual Change= −3.5% 95% CI[−4.69,−2.31] p= 0 n= 78
Annual Change= −0.92% 95% CI[−2.33,0.56] p= 0.168 n= 98
Superior_AsUsual
Superior_WithNew
Annual Index
Year
1.1
0.9
0.7
0.5
0.3
1995
2000
2005
2010
2015


Yellow−bellied Sapsucker
Annual Change= 0.6% 95% CI[−0.41,1.71] p= 0.264 n= 117
Annual Change= 0.69% 95% CI[−0.37,1.8] p= 0.2 n= 127
Superior_AsUsual
Superior_WithNew
Annual Index
Year
0.3
0.4
0.5
0.6
0.7
1995
2000
2005
2010
2015


Northern Flicker (Yellow−shafted)
Annual Change= 0.66% 95% CI[−0.98,2.21] p= 0.456 n= 74
Annual Change= 0.66% 95% CI[−0.79,2.2] p= 0.476 n= 74
Superior_AsUsual
Superior_WithNew
Annual Index
0.1
0.2
0.3
0.4
1995
2000
2005
2010
2015
Year