

**THE 1999 BREEDING SEASON REPORT FOR THE CAPE SABLE
SEASIDE SPARROW.**

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I. Summary

The following three sections describe results from the 1999 breeding season study of the Cape Sable seaside sparrow (*Ammodramus miritamus mirabilis*). The first section reviews the year in terms of nesting success. Our efforts this year extended beyond early June. Although this is not the first year we have followed late-season nests, this is the first year we have kept ~10 individuals working 6 days a week well into the summer months. We found several late-season nests allowing a comparison in success rates between nests that hatched before and after the onset of summer rains. Most late-season nests failed which is consistent with sporadic data on late-season nests gathered in previous years. The inclusion of these late-season nests in an overall 1999 breeding success calculation pulls the resultant value down. We attribute this low nesting success rate to the unusually dry conditions at the beginning of the breeding season and heavier late-season predation pressure.

The remainder of this report details research efforts initiated this year. This year we began fixed-radius point count censusing within intensive study plots in order to test assumptions of the extensive helicopter survey. We also set-up study units to test the effects of fire on Cape Sable seaside sparrow demographic parameters. We continued collecting microhabitat information around nests and within territories in an effort to pinpoint habitat correlations with breeding success. We have not updated these results as they do not vary from those reported in the 1998 Annual Report. These results are being prepared for submission in a peer-reviewed journal; the manuscript will be posted on this web site for public viewing after submission.

To understand the 1999 breeding season, we first characterize the year in terms of hydrology. The 1999 breeding season began with no surface water within, or around, our study plots. Fig. 1.1 shows average daily water levels from five hydrological monitoring stations (operated by Everglades National Park) that are within ~1km of our study plots. We include all available records since the beginning of our study efforts in 1992. In almost all plots, this March was the driest since 1992. This was especially so for the Old Ingraham Highway plots (Ingraham North, Ingraham South, and Far East: sub-population B) and the East Side plot (sub-population E). However, the Shark Valley plot (sub-population A) does not appear noticeably drier than in years past.

At the time of writing, hydrological data from these stations was not available past March. However, our field notes show that the summer rains began in mid- to late-May. Surface water was present at slightly different times within each of the sub-populations following these rains. The Shark Valley plot (sub-population A) began to consistently have surface water by May 5, whereas the 'core' plots (sub-population B) began to consistently have surface water around May 20. The East Side plot (sub-population E) did not have surface water until late-June.

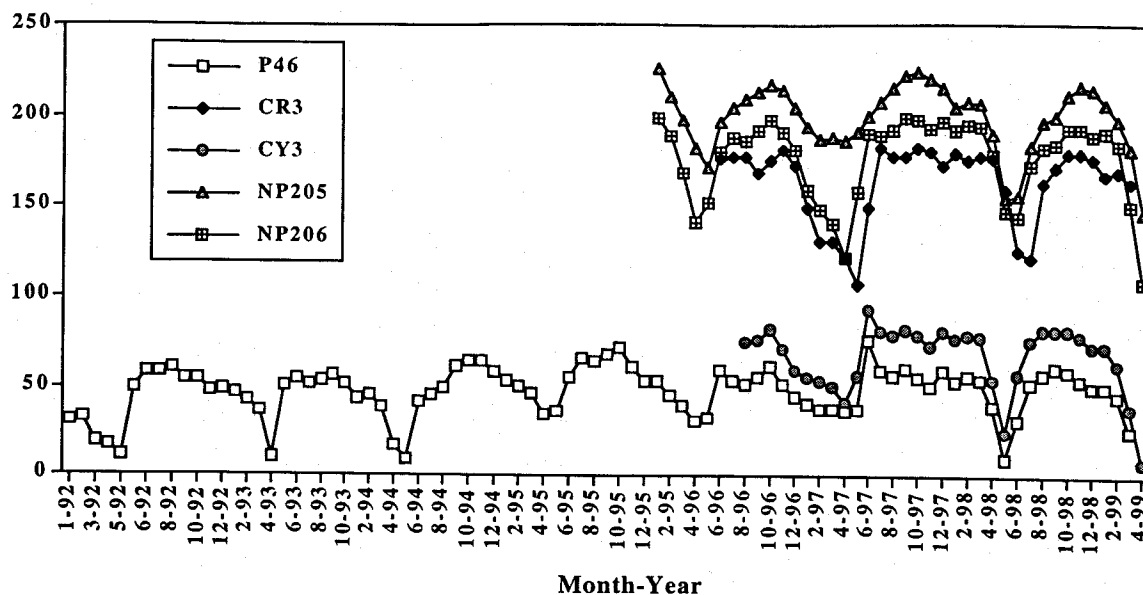


Figure 1.1. Hydroperiod graph from ENP monitoring stations based in proximity to our study plots. P46 is near the Main Park Road plots, CY3 is near the Old Ingraham Highway Plots, NP205 is near our Shark Valley plot, and CR3 and NP206 are near our East Side plot. Water levels are given as centimeters above mean sea level.

II. Nest success.

We began searching for nests in late-March 1999 and continued through July. We identified 140 nests. Seventy-four of these nests were found in the three plots along Old Ingraham Highway and 44 were found in the four plots along Main Park Road. We also located 17 nests in our East Side plot and five nests in our Shark Valley plot. The first nest was found on 10 April. Nesting activity continued until the final two nests were discovered on the 10 July.

Elevated nest-searching efforts enabled us to identify 16 multiple-nest pairs. All 16 constructed a second clutch. Two pairs constructed a third-clutch nest, and one pair established a fourth-clutch nest. The earliest second-clutch nest was discovered on 16 May and we found the first third-clutch nest on 5 June. Only sparrows within the Shark Valley plot did not have a second clutch nest.

The average number of eggs laid was 3.14 (sd= 0.59; n=79). This is somewhat lower than in previous years (see Demography section). Our first 4-egg nest was found on 23 May. In the subsequent month-and-a-half there were 25 nests found with four eggs or nestlings. The average number of nestlings was 2.67 (sd=0.85; n=85) which is fewer

than in previous years (see Demography section). This reduction was most likely due to the extremely dry conditions in the first few months of the breeding season. We observed numerous indicators of stress. We noted one female laying one egg every other day rather than the normal egg per day. In addition, we noted upon banding that a number of nests contained nestlings of varying sizes. This is an indication of preferential feeding of one or two nestlings by their parents.

Cape Sable seaside sparrow nesting success was low this year. Seventy-one of the 140 nests failed before completion. Most nests were lost to apparent predation. Direct evidence of predation was observed in a small number of nests. Broken egg shells were found in the bottom of ten failed nests and dismembered nestlings in two. Two nests were abandoned during our observations. Eggs or nestlings simply dissappeared between visits in most nest losses indicating snake predation. One nest failed when water entered the nest following the late-May rains and twelve nests were discovered empty with no subsequent activity observed.

Fig. 2.1 shows that the 1999 Mayfield nesting success rate (Mayfield 1975) was 15% ($2 \times se = 0.35$), a substantial reduction from the totals recorded in previous years (~40%). Only the East Side plot had by a nesting success rate similar to past years, reaching a comparatively high value of 44%. Nests found in Shark Valley had the lowest success rate, however the sample size was small ($N=5$).

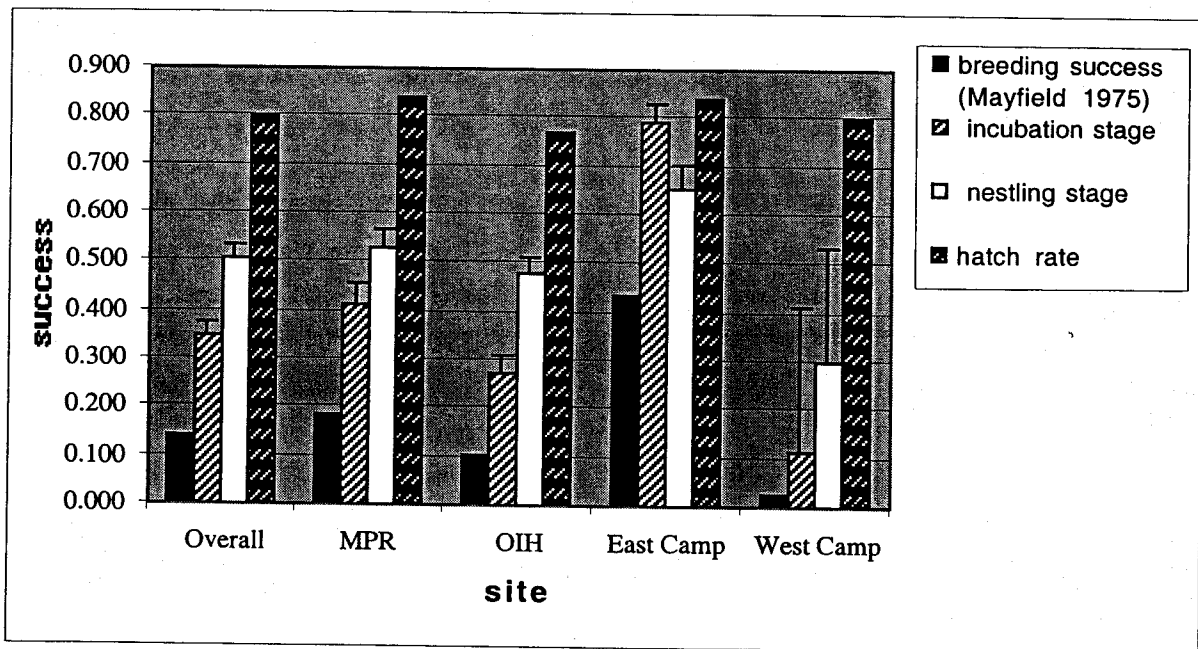


Figure 2.1. Collective and individual breeding success rates at four Cape Sable Seaside sparrow habitat sites in Everglades National Park, FL. Error bars represent the 95% confidence interval.

Incubation success (35%) was noticeably less than nestling success (51%). Incubation and nestling success were markedly higher for East Camp plot (Fig. 2.1). Hatch rate hovered around 80% for all of the plots. Hatch rate was not calculated for the Shark Valley plot because no nests were observed through the hatching event. Given this limited data we used the cumulative hatch rate in calculations of breeding success in this sub-population (A).

To identify changes in nest success rate through the breeding season, we separated our nests into two groups. We placed a nest into the 'early-season' group if the nest hatched young before 1 June. We placed a nest into the 'late-season' group if the hatch date was after June 1. June 1 provides a logical cut-off as this is when the summer rains typically begin and thus surface water is present within our study plots.

We discovered 70 early- and 70 late-season nests in 1999. Although the total number of nests was distributed equally between these two groups, individual plots varied in early- to late-season nest ratios. Early- to late-season ratios were as follows: (1) Main Park Road--27:17; (2) East Side--10:7; (3) Shark Valley--4:1, (4) Old Ingraham Highway --29:45. When the Old Ingraham Highway plots and Main Park Road plots are consolidated to characterize sub-population B, the ratio of early- to late-season nests approached unity (56:62).

There was a marked difference in the number of nest failures observed over time. Of the 71 failed nests, 49 of them occurred after 1 June. In the Old Ingraham Highway plots, the difference between failures in the early- and late-season was three fold. Thirty-four of 45 failures in this area occurred in the late-season. The East Side and Shark Valley plots had an equal number of failures in the early- and late-season, while in the Main Park Road plots 12 of 20 failures were observed during the late-season. Combining totals from Main Park Road and Old Ingraham Highway plots, 71% of the failures occurred during the late-season.

Figure 2.2 shows that breeding success dropped 23% in the late-season. Most of this reduction can be attributed to the 54% drop in incubation success during the late-season. Nestling success remained relatively constant. Hatch rate decreased to less than 77% in all four of our study areas, accounting for the remainder of the reduction in breeding success. Only one plot, East Side, had an increased incubation success rate during the late-season. Nests in this plot decreased only 10% in breeding success; a comparatively small reduction (see Fig. 2.2 for comparison with other plots). The largest decrease in incubation success was observed in the Main Park Road plots where incubation success dropped 72% during the late-season. Nestling success was slightly down in all of the plots except for the Main Park Road plots, where a 23% increase in success was observed.

Given that previous research crews stopped field work in the beginning of June, the early season results are directly comparable to those of previous years. The 1999

early-season nest success rate was 30%, a value substantially less than that observed in previous years.

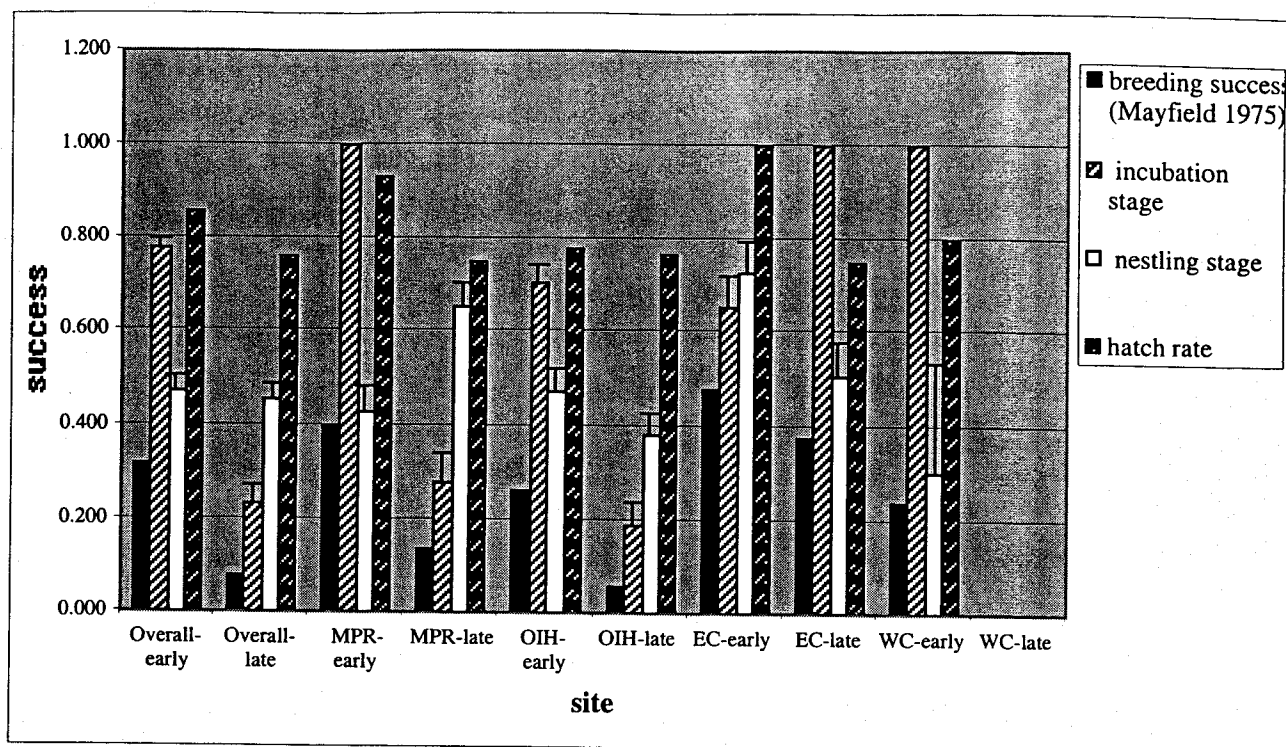


Figure 2.2. Comparison of breeding success in early- and late-season nests in four sites in Everglades National Park, FL. MPR=Main Park Road; OIH=Old Ingraham Highway; EC=East Side; WC=Shark Valley. Error bars equal 95% confidence interval.

III. Influence of fire.

Fire has always been present in the Everglades due to lightening-strikes during wet season storms. These fires maintain the freshwater prairies that support the Cape Sable seaside sparrow because they prevent the invasion of hardwood species (Craighhead, 1971). However, they may harm the bird in the short-term through direct mortality (Curnutt et al. 1998).

Werner (1975) found that Cape Sable seaside sparrows began to use marl prairies approximately one year after a fire and that sparrow density increased through the third year post-fire. After the fourth year, sparrow density declined. Werner (1975) concluded that dead biomass accumulates through time and ultimately causes the habitat to become unsuitable for sparrow nesting. Curnutt et al. (1998) compared extensive point-count

survey results to the frequency of recorded fires within eastern Everglades National Park. Their findings generally agree with those of Werner (1975) and Taylor (1982) indicating that sparrows will use an area within one to three years post fire. However, Curnutt et al. (1998) found that areas that burn once every one to three years will be unavailable for use by Cape Sable seaside sparrows. In addition, Curnutt et al. (1998) found no decrease in sparrow densities 10 years post-fire.

Curnutt et al. (1998) did not conduct detailed vegetation analyses. Thus, their results are of limited use in understanding how fire effects sparrow habitat and in turn how those habitat changes affect sparrow demographic parameters (e.g., reproductive success, survivorship). Taylor (1982) and Werner (1975) conducted analyses of vegetation changes within sparrow habitat and do provide a link between fire, habitat changes, and (to some extent) changes in demographic parameters. However, each of these latter studies have drawbacks that limit our ability to infer causation. Werner (1975) and Taylor (1981) estimated sparrow densities within areas with known burn histories (all within the Taylor Slough sub-population now called C). Each author thus assumes that changes in sparrow density occurring across the spatial extent of their study plot correspond to changes likely to have been observed through time: a classic synchronic study or 'space-for-time' substitution.

There are serious limitations to the synchronic approach of estimating population change in relation to fire. Perhaps the most serious was described by Whelan (1995) as '...the potential covariation of fire history differences and the observed population differences with a third (probably unknown) site-specific variable'. Taylor (1981) reports results from areas studied pre- and post-fire and thus some of his conclusions appear robust. One in particular is the co-variation of soil depth to the time required for suitable sparrow habitat to develop.

In 1999 we began a complimentary study to that of Curnutt et al. (1998) looking at changes in sparrow demography and habitat due to fire frequency within eastern ENP. Whelan (1995) recommends the use of a fully replicated experimental design for the study of population changes due to fire. However, there are several logistical constraints to such studies (Whelan 1995). The most relevant here is the inability to control prescribed fires. It is unethical to institute a series of prescribed burns within the habitat of an endangered species; especially given that fires are inherently unpredictable and, even under tight supervision, may burn out of control. With this limitation in mind, we adopted two experimental designs.

In our first fire unit we are assuming a space-for-time substitution just as Werner (1975) and Taylor (1982). However, we test the underlying assumption that spatial differences adequately replicate temporal changes by following our sampled areas for several years. Thus, any changes that occur across space can be cross-checked by looking for similar changes through time. If there are differences between

chronosequences and spatial sequences, we can temper our conclusions appropriately and begin to understand how differences between previous research results may be reconciled.

We utilized computerized satellite images of fire frequency to divide our East Side study plot into sub-plots that correspond to four fire frequencies: West Flag sub-plot burned once since 1980, Blue sub-plot burned three times since 1980, Purple sub-plot burned two times, and Green–Yellow sub-plot spanned an area that burned four and five times since 1980. The entire East Side study plot is 1.5x2.5km in area. The sub-plots have not been mapped, however they range roughly from 0.5 to 0.1km² in area.

We have been finding and following nests in this study plot since 1997, thus far locating 31 nests. We have also been banding adults and juveniles since 1997. Every breeding season, we map the location of all territories and nests using a Global Positioning System (GPS). In addition, we census sparrows within this plot twice weekly from fixed points. Thus, we can document the annual productivity, density and survivorship of sparrows in each sub-plot.

In 1999 we placed belt transects within each sub-plot and sampled the vegetation within 11 1m² quadrats. We also recorded the maximum and minimum depth of the soil within each sampled quadrat. These vegetation samples are in fixed positions and will be re-sampled in years to come. Thus, we can establish links between habitat and demographic differences observed across the various fire frequency sub-plots.

In our second fire unit, we compare burned and unburned segments of sparrow habitat before and after the burn occurred. A fire in 1995 burned portions of sub-population E habitat, but left other adjacent areas intact. A section of this sub-population is accessible by foot from Main Park Road just north of the Royal Palm turnoff. Because we have been censusing this area annually since 1992 we can compare sparrow density pre- and post- fire within burned and unburned areas. This year we began collecting vegetation samples within these same areas. Although vegetation results can not be viewed as rigorously as the census results, they will provide some insight into the change in habitat due to the burn.

This experimental approach is analogous to models of environmental impact assessment (Whelan 1995), therefore the statistical treatments of the resulting data are fairly well-known (Stewart–Oaten et al. 1986). This design is somewhat analogous to a sub-section of the experiments reported by Taylor (1982) in that we include density information before and after a burn, and equivalent information in a non-burned control plot.

Ideally we could follow not only sparrow density but also annual productivity (from monitored nests) and survivorship (from banded individuals) within our burned and unburned plots. However, we do not have pre-burn information and thus our results would be of questionable import. It is possible for us to conduct a similar experiment

only if a *portion* of an existing intensive study plot burns within the coming years. We hope to include preliminary results from these fire units within the next year.

IV. Census results

In response to the AOU review committee recommendations, we instituted a point count census protocol within our intensive study plots. This census was designed to replicate the extensive helicopter survey in order to test three assumptions: 1) that all birds within a 200m radius are likely to be heard or seen by an observer 2) that the number of birds heard within a 7 minute census interval should be multiplied by 16 to obtain a realistic estimate of the number of individuals within 1km² and 3) that the extensive survey is best conducted early in the breeding season as this is when most individuals are likely to be detected.

In order to replicate the extensive survey, we placed census points (poles) 400m apart such that the area surveyed at each pole represented a 200m radius. All poles were placed within, or just outside, of our plot boundaries. We visited a sub-set of all census poles each day, with any one census pole being visited every other day. We limited the personnel conducting these censuses to three; all of whom were familiar with the sparrows and their behaviors. We recorded any birds detected by sight or sound. We also recorded all behaviors exhibited and identified individuals by leg band color combination. The duration of each count was 7 minutes.

These intensive study plot censuses were initiated on 31 May 1999 and completed on 19 July 1999. The results presented below should be used in conjunction with the 1999 helicopter re-survey as these two censuses were conducted concurrently. In addition, we can not fully evaluate the third assumption of whether the best time to conduct the extensive survey is early in the breeding season.

The average number of individuals observed per census pole was 2.74 (± 1.08). The figure below (Fig. 4.1) is a typical example of results from one study plot. The number of individuals detected remains relatively constant across any one plot.

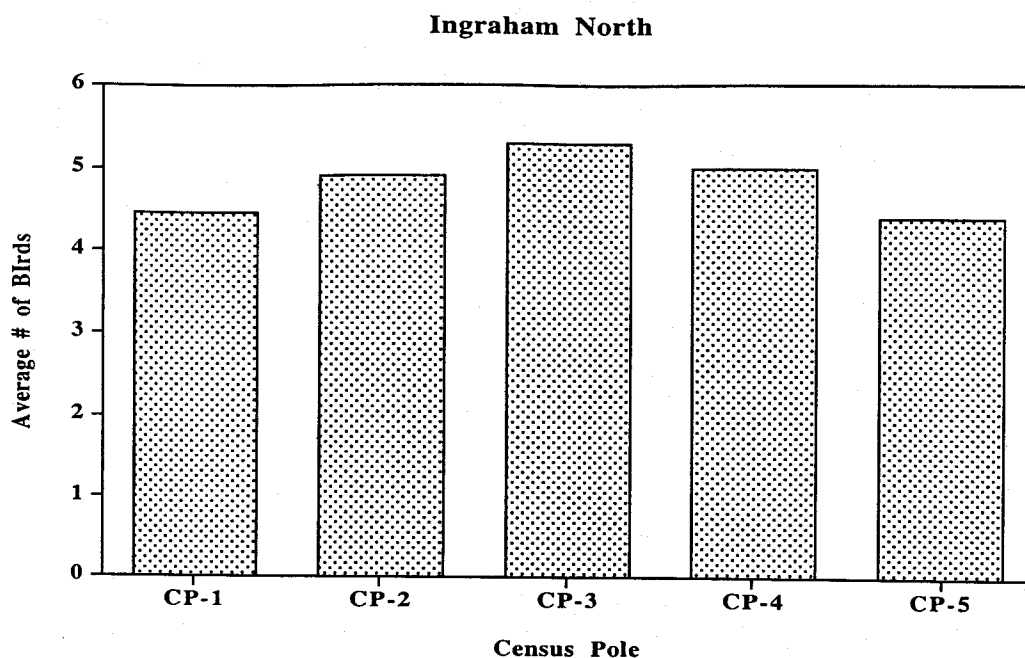


Figure 4.1. The average number of sparrows detected at each of six census poles placed in the Ingraham North study plot.

Table 4.1 shows the average number of individuals detected per census point within each plot. There is some variation in the number of individuals detected across sub-populations, and across plots within the same sub-population. The Shark Valley plot, within sub-population A, has a noticeably low number of individuals detected. However, it is comparable to our lowest density plot (North Mahogany) within sub-population B.

We estimated the number of individuals found within a 1km^2 area by multiplying our results per census pole by eight. The average number of birds counted per 200m in our intensive plot censuses was 2.74 ± 1.08 . Thus, the average number of birds per 1km^2 was 21.93 ± 8.62 (Table 4.1).

Every year we map territories found within our study plots. These territory maps provide a more thorough accounting of how many species are resident in our plots. Figure 4.2 compares the average number of birds counted at the censuses poles to the average 'true' number of birds within 200m of those poles derived from our territory mapping efforts. Territory maps show an average of 5.24 males (± 1.98) compared to 2.74 birds per pole. Census poles in Sweetbay and Shark Valley were not mapped correctly and thus we were unable to compare the census pole results to the mapping results.

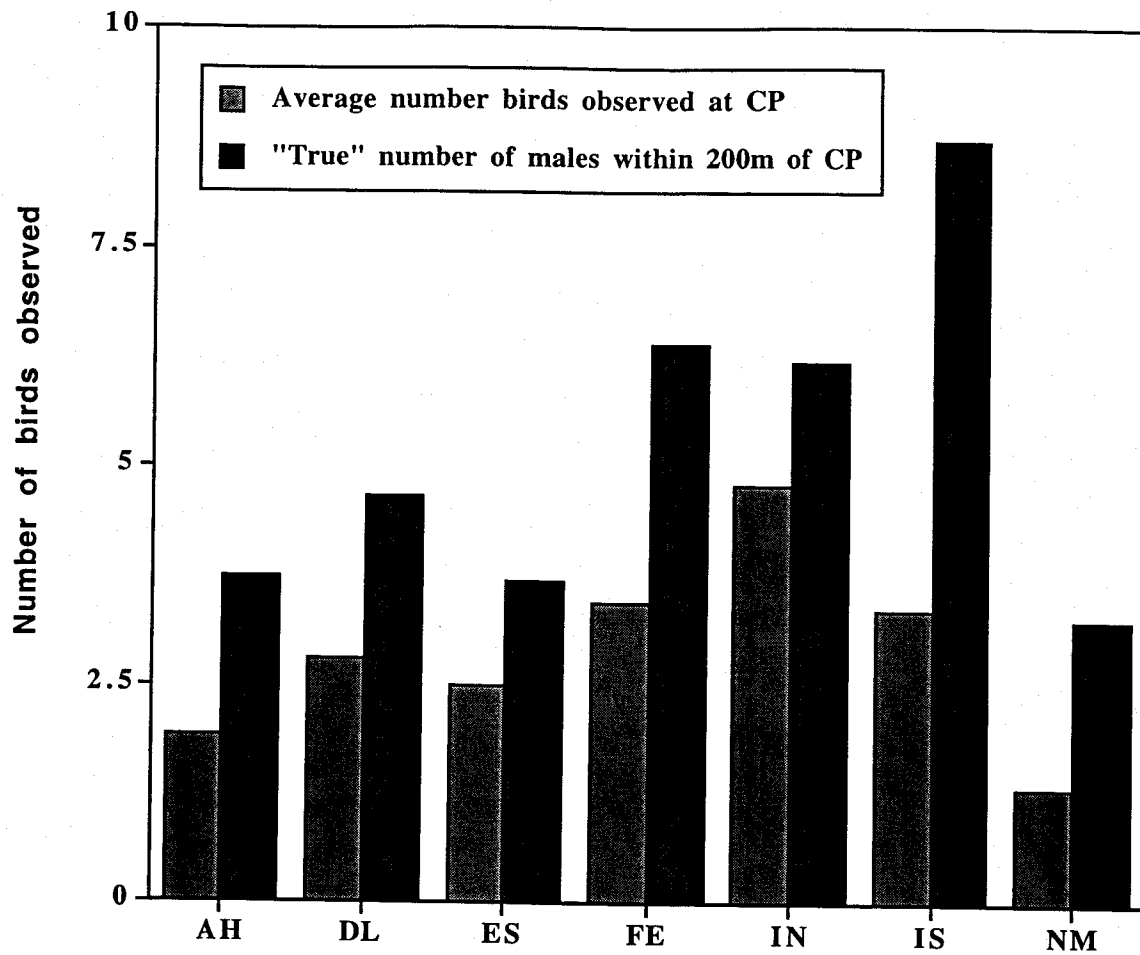


Figure 4.2. Number of birds counted at census poles (CP) within each plot compared to the number of birds recorded on territory maps. Territory maps give reliable (truer) estimates of density. Plot acronyms match Table 4.1.

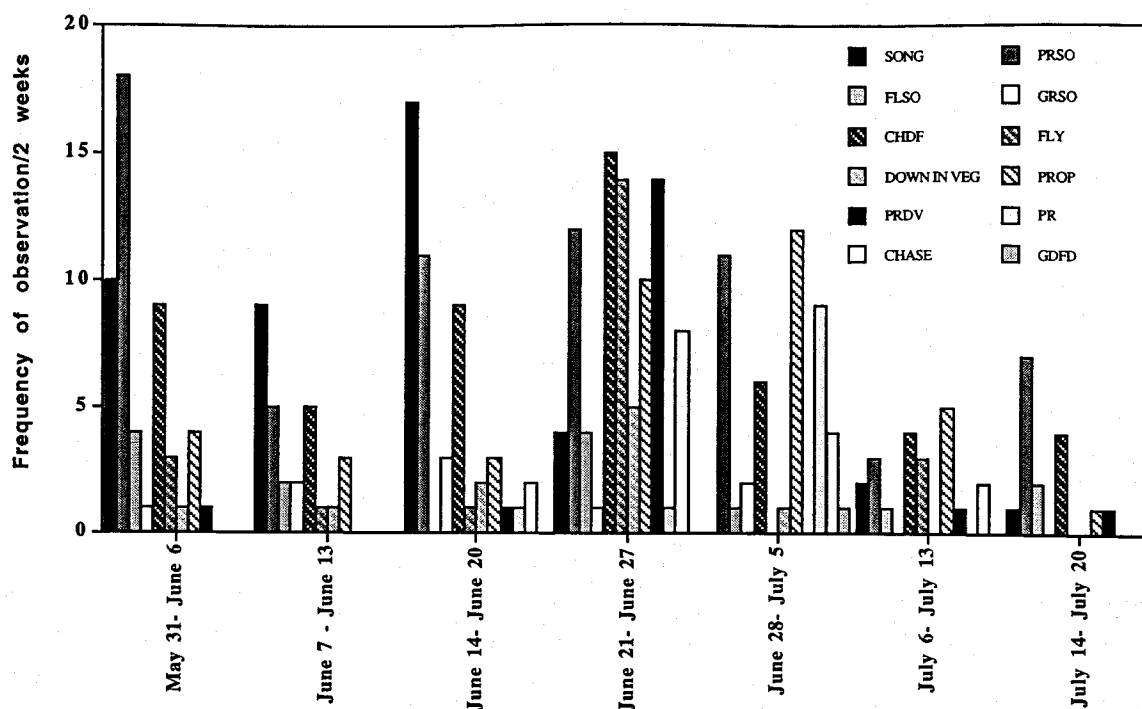


Figure 4.3. Frequency that sparrow behaviors were observed through June and July. Behaviors were recorded during census intervals. Behavior acronyms match those in Table 4.2.

Table 4.2. Behavior acronym and description.

acronym	meaning	acronym	meaning
PRDV	perched in dense vegetation	CHASE	two individuals chasing each other
PROP	perched in open prairie	FIGHT	two individuals physically fighting
GRSO	singing in dense veg or from ground	CHDF	chipping in defense
PRSO	perched and singing (males only)	SEEP	seep call
FLSO	flight song	NSDC	nest departure call
GDFD	gathering and delivering food to nest	EPDS	epaulet display