

1999

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Recommended Citation

Thibodeau, Michael D. (1999) "Analysis of Mist Net Tier Capture Frequencies in a Coastal California Riparian Habitat," *North American Bird Bander*. Vol. 24 : Iss. 1 , Article 2.
Available at: <https://digitalcommons.usf.edu/nabb/vol24/iss1/2>

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Analysis of Mist Net Tier Capture Frequencies in a Coastal California Riparian Habitat

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ABSTRACT

The Big Sur Ornithology Lab is a constant-effort mist netting station located by the mouth of the Big Sur River in Monterey County, California. During the springs of 1996 and 1997, mist net tier capture data were collected and analyzed to determine if alterations in the mist net support system would affect tier capture frequencies. Slight differences in tier capture frequencies were observed between two higher placed nets supported by an old support system and other lower nets with a newer support system. Because most of the overall captures (66%) were recorded in the two middle net tiers, capture rates at this station should not be significantly affected by periodic small differences in individual net height. In addition, net tier capture frequencies of individual species and related groups of species seemed to reflect their niche and nest placement preferences.

INTRODUCTION

In early spring 1996, Big Sur Ornithology Lab changed the way we supported individual mist nets. Instead of having each pole supported upright by rebar and a tie cord running from the top of each pole to a stake in the ground, we supported one pole with a piece of rebar along with one adjustable tie cord attached at waist level and the other pole stands free held erect by two adjustable tie cords attached at waist level. This method of supporting the nets allows the top tier to be set lower on average than with the previous method. The old support design allowed the lower tier to sag too low to the ground unless the net was set high on the poles. We were concerned that the lower net height of the new support system might affect capture rates compared to past efforts, especially with regard to the highest tier. As a result, we kept two nets (7 and 8) supported by the old system and the other nets were converted to the new system. Our objective was to determine if

these changes would affect capture rates in the top tier. Moreover, these data provided an opportunity to examine various species and groups of birds to see if the tiers in which they were captured reflected their niche preference. For example, ground dwelling species such as sparrows would most likely be captured in the bottom tiers, while canopy dwelling species such as Chestnut-backed Chickadee (*Poecile rufescens*) would most likely be in the top tiers.

STUDY AREA AND METHODS

The study site is located in Andrew Molera State Park, Monterey County, California, approximately 33 km south of the city of Carmel. The habitat is riparian woodland situated along the Big Sur River characterized by an association of willows (*Salix* spp.), Fremont cottonwoods (*Populus fremontii*), western sycamores (*Platanus racemosa*), red alder (*Alnus rubra*), and coastal live oak (*Quercus agrifolia*), with a complex understory of small trees, shrubs, and herbaceous perennials and annuals. All mist nets are placed in thick riparian vegetation along the Big Sur River, except for three nets which are placed in riparian vegetation but located about 60 m away from the river adjacent to a coastal sage-scrub hillside.

Data were collected by the Big Sur Ornithology Lab, a constant-effort mist netting station with 21 standard mist nets that are 21 m in length and about 2.5 m high. Mist net 3B, which is considered the canopy net, is placed directly above net 3A, making its highest tier approximately 5 m above ground level. The day-to-day netting procedures

are outlined in Ralph et al. (1993). From 7 April through 6 June 1996, and from 3 April through 21 April 1997, we recorded the net tiers in which each individual bird was captured tier 1 being the lowest and tier 4 being the highest. As a result of the individual net supporting systems, nets 7 and 8 were, on average, set up about 16 cm higher than the other nets. I tested the tier capture frequencies for nets 7 and 8 and all other nets combined with the chi-square goodness of fit analysis with $\alpha = 0.05$.

RESULTS

Captures were not evenly distributed throughout the tiers (Table 1). Overall, the smallest proportion of captures, only 10% and 13%, occurred in the top tiers (4) of the lower and higher nets, respectively. The highest capture rates were recorded in tiers 2 and 3, 68% and 66% of the lower and higher nets, respectively. The bottom tier (1) accounted for less than 25% of all captures.

Table 1. Tier Capture Frequencies and Percents.

Tier	Nets 7&8		All But 7 & 8	
	n	%	n	%
4	11	13	71	10
3	31	37	215	29
2	27	32	258	36
1	16	19	183	25
Chi-Sq.	12.271		113.052	
P	<0.01		<0.01	

For species and combined groups of species with sufficient data, I examined their overall capture frequencies per net tier and the frequencies in which they were captured in the canopy net 3B (Table 2). The majority of the Chestnut-backed Chickadees were captured in the top two tiers with the largest percentage, 58%, in tier 3. Nineteen percent of all captures in the canopy net were Chestnut-backed Chickadees. Hummingbirds (*Calypte* and *Selasphorus* spp.) were also captured primarily in tier 3. In fact, 64% were caught in the upper two tiers, while their numbers

made up 14% of all canopy net captures. The highest percent of Bushtits (*Psaltiriparus minimus*) were captured in tier 3, and 70% were in the upper two tiers, but represented only 2% of all captures in the canopy net.

Three groups of species were captured primarily in the middle tier. Eighty percent of Wrentit (*Chamaea fasciata*) captures were in the two middle tiers. Of all captures in the canopy net, only about 2% were Wrentits. Similarly, 83% of all thrushes (*Catharus guttatus* and *C. ustulatus*) were captured in the two middle tiers and no captures were recorded in the canopy net. The birds associated with nesting and foraging in the lower canopy cover (Wilson's [*Wilsonia pusilla*], Orange-crowned [*Vermivora celata*], MacGillivray's [*Oporonis tolmiei*], and Nashville [*V. ruficapilla*] warblers) were mostly captured in the middle tiers (68%); they comprised 12% of the total captures in the canopy net.

Several species were associated primarily with the lower tiers. Most of the Common Yellowthroats (*Geothlypis trichas*) were captured in the bottom two tiers, while they made up 2% of all captures in the canopy net. Over 70% of wrens (*Troglodytes aedon* and *Thryomanes bewickii*), sparrows (*Melospiza*, *Zonotrichia*, and *Passerella* spp.), and Yellow-breasted Chats (*Icteria virens*) were caught in the bottom two tiers. No wrens were observed in the canopy net, while sparrows and Yellow-breasted Chats each represented 8% of all captures in that net. Although the chi-square goodness of fit analysis suggested that all towhee (*Pipilo maculatus* and *P. fuscus*) captures were distributed evenly between the tiers ($0.10 < P < 0.25$), almost 50% were captured on tier 2 and about 74% were captured in the bottom two tiers. In addition, only about 2% of the total captures in the canopy net represented towhees. Chi-square analysis suggested that vireos, primarily Warbling Vireo (*Vireo gilvus*) ($0.50 < P < 0.75$), and higher canopy warblers, in this case, Yellow-rumped (*Dendroica coronata*) and Yellow (*D. petechia*) ($0.50 < P < 0.70$), were distributed evenly among all the tiers. No vireos were recorded in the canopy net. Fourteen percent of all captures consisted of the higher canopy warblers.

Table 2. Percent of Net Tier Captures for Species and Groups of Species.

Species	Tier 1	Tier 2	Tier 3	Tier 4	n	Chi-Sq.	P Values	Net 3B
Sparrows	48%	31%	17%	4%	134	30.701	$P < 0.001$	8%
High Warblers	13%	6%	36%	26%	31	2.919	$0.50 < P < 0.75$	14%
Low Warblers	20%	35%	33%	13%	174	17.621	$P < 0.001$	12%
CBCH	3%	16%	58%	23%	31	14.403	$0.001 < P < 0.005$	19%
Wrens	42%	32%	21%	5%	38	9.105	$0.025 < P < 0.05$	0
Vireos	11%	39%	29%	21%	28	2.286	$0.50 < P < 0.75$	0
Hummers	8%	28%	47%	17%	53	13.217	$0.001 < P < 0.005$	14%
Thrushes	14%	47%	36%	3%	98	25.816	$P < 0.001$	0
Towhees	26%	48%	17%	9%	23	5.935	$0.10 < P < 0.2$	2%
YBCH	32%	46%	18%	5%	22	7.182	$0.05 < P < 0.10$	8%
BUSH	8%	23%	62%	8%	13	9.733	$0.01 < P < 0.025$	2%
COYE	40%	45%	13%	2%	60	19.733	$P < 0.001$	2%
Wrentit	15%	40%	40%	5%	40	12.200	$0.005 < P < 0.01$	2%

DISCUSSION

Only a 3% difference was observed in the highest tier capture frequencies between the higher nets 7 and 8 and all the other nets that were operated, on average, lower. As a result, I conclude that conversion of nets from the old support system to the new one does not affect significantly the overall capture rates. Since the majority of captures were in the middle net tiers (66%), capture rates at our station should not be affected significantly by periodic small differences in individual net height. Thus, accurate yearly comparisons can still be made between data collected before and after the support system alterations.

In addition, net tier capture frequencies of related groups of birds and individual species do tend to reflect their niche and nest placement preferences. I consulted Ehrlich et al. (1988) to determine the niche and nest placement preferences of the study species.

Ground-dwelling Hermit and Swainson's thrushes were captured predominately in the second lowest tier, tier 2, and none were captured in the canopy net. Other ground-dwelling species, such as sparrows, wrens, and Common Yellowthroats, were also captured primarily in the lower tiers.

Seventy-four percent of all towhees and 78% of all Yellow-breasted Chats were captured in the bottom two tiers, thus reflecting their lower-canopy niche preference.

Moving slightly higher in the canopy level, the warblers that are associated with foraging and nesting in relatively low cover were captured mostly in the middle tiers. Wrentits, birds that nest and forage in shrubs, were captured mostly in the two middle tiers. Common Bushtits, that are primarily bark gleaners and commonly nest in medium-to-high shrubs, were captured mostly in the second to the top net tier.

Several species and groups of species captured at our station prefer to nest and forage in the upper canopy. Almost one-half of the hummingbirds were captured in tier 3. The high frequency of captures in this upper tier may be explained by the fact that these hummers usually nest in shrubs and trees between 0.5 m and 10 m above ground level, feed on nectar-producing shrubs and forbs above the ground, and perform their courtship displays high in the air. Chestnut-backed Chickadee, a numerous representative of a high canopy avian guild, were captured most frequently in the top tiers and represented the highest capture rate in our canopy net, 19%. Contrary to my expectations, the warblers and vireos that are also a member of this

avian guild were, according to the chi-square analysis, distributed evenly throughout the net tiers and did not show a tendency to be captured in the higher net tiers. These results may reflect increased competition between these species and the abundant Chestnut-backed Chickadees which may force these normally high canopy species to forage lower in the canopy. Additional testing and a larger sample size would be necessary to support fully such a hypothesis.

ACKNOWLEDGMENTS

I thank Jim Booker, Craig Hohenberger, and the interns at the Big Sur Ornithology Lab for their help and support with data collection.

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News, Notes, Comments

Longevity Record for the Tree Swallow

The oldest Tree Swallow (*Tachycineta bicolor*) reported to date is an 11-year-old female (Hussell 1982, Clapp et al. 1983). That bird was banded as a breeding one-year-old female in a nest box at Long Point, Ontario (42°33' N, 80°04' W) in 1970 and was recaptured ten years later at the same place. Here we report a male Tree Swallow that lived to an age of at least 12 years.

On 3 July 1998, SJA recaptured a male Tree Swallow wearing band 2051-84139 at nest box no. 30 at the Port Rowan Sewage Lagoon (42°37'N, 80°27'W). This bird had been banded as a nestling in nest box no. 44A, located about 49 m from the recapture site, on 14 June 1986 (Table 1). It hatched and was identified individually with ink marks on 1 June 1986, so it was 12 years and 32 days old when it was recaptured in 1998.

Tree Swallow 2051-84139 had an excellent start in life. It was among the first three young to hatch in a brood of seven. When it was weighed on 14 and 18 June 1986, it was the heaviest member of its brood, at 23.6 g and 23.8 g, respectively (the others ranged from 13.6 g to 23.4 g on 14 June and from 16.1 g to 23.6 g on 18 June). Moreover, this nestling was well above average weight for its age, since broods at the Sewage Lagoon tend to be

heavier than those at other sites (for example, see Quinney et al. 1986, Table 6).

No. 2051-84139 was first recaptured as a two-year-old male (sexed by cloacal protuberance) when it was attending a brood of six young in the same nest box (no. 44A) in which it had been raised.

Most of the nest boxes at the Sewage Lagoon site are about 1.5 m above the ground on metal poles spaced 24.4 m apart in a single line around the perimeter of the two lagoons. However, box no. 44A was one of a pair of boxes (the other was no. 44) that had been set up spaced about 3 m apart. Several such pairs were set up in 1983 in an attempt to induce an increase in the incidence of polygyny, which occurs normally in about 5% of nestings at this site (Quinney 1983). In 1989, nest box no. 44A and other closely spaced nest boxes were removed to return all boxes at this site to the standard 24.4 m spacing.

No. 2051-84139 was not captured in 1989, but it was caught attending nestlings at nest box no. 31 in every year from 1990 to 1994. Box no. 31 is located 24.4 m from box no. 44, and about the same distance from the former site of box no. 44A.

After 1994, this Tree Swallow was not seen again