Net avoidance in passerine birds

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Introduction and Methods

Mist nets are frequently used to assess or monitor populations because they greatly reduce observer bias and are non-selective in comparison to visual or aural census methods (Low 1957, MacArthur and MacArthur 1974, Karr 1981, Keyes and Grue 1982, Jenni et al. 1996, Remsen and Good 1996). The use of mist-nets for population assessments has pushed some researchers (e.g. Karr 1981) to identify factors causing variation in capture rates, as these have potentially important consequences on the accuracy of population estimates. These include weather, time of day, net location, tension of the net, structure of adjacent habitat, and species specific behaviour such as net shyness, territoriality, flight patterns and migration (Karr 1981, Keyes and Grue 1982, Remsen and Good 1996). However, most authors have inferred these factors through personal observations, variation in capture rates, or other studies that measured bird activity without the use of mist nets. Few studies have attempted to evaluate behavioural responses of birds to mist nets in comparison with capture rates. Our objective was therefore to assess net avoidance by passerine birds through direct observation of their behaviour around mist nets. More specifically, we assessed variations among species and families with respect to evasion rate, defined as a sudden shift in a flight pattern permitting a bird to avoid a net.

This study was conducted at a single series of 3 mist nets (the 'D' nets) at the McGill Bird Observatory during the 2006 Spring Migration Monitoring Program (April 18 - June 2). During each observation period we recorded the species and sex (if possible) of each bird flying toward the net and directly above the net (within <0.75 m of the top) – the latter as a potential measurement of activity surrounding the nets. When flying toward the net, the behaviour of a bird was recorded as either a net evasion (E) as defined previously, an unsuccessful capture (a bird that hit the net but bounced out immediately or otherwise escaped on its own) (U) or a successful capture (S). Evasion rates (Fig 1) were used as input for subsequent principal component analyses to assess effects of wind speed and shading, and for a Chi-square goodness-of-fit test for differences in evasion rates between species.

$$\text{Evasion Rate} = \frac{E}{E+U+S}$$

Figure 1. Formula for the calculation of evasion rates, where E is total evasion for a species or family, U is an unsuccessful capture and S is a successful capture. E+U+S can also be defined as the total number of flights toward the net.

Results and Discussion

The principal component analyses yielded inconclusive results and will not be discussed further in this report; additional data collection will be required to assess the effects of wind and shading on mist nets at the McGill Bird Observatory.

Swallows were the only birds that showed a significant difference between sunny and shady conditions in terms of the frequency of net approaches (Fig 2), flying toward the nets more often when they were in the shade (Fisher's exact test for independence, p=0.037), suggesting that the greater visibility of the nets in sunlight may have caused the swallows to avoid the nets. For other species the total number of birds flying above the net was not found to be a relevant measure of bird activity and was therefore excluded from further analyses.

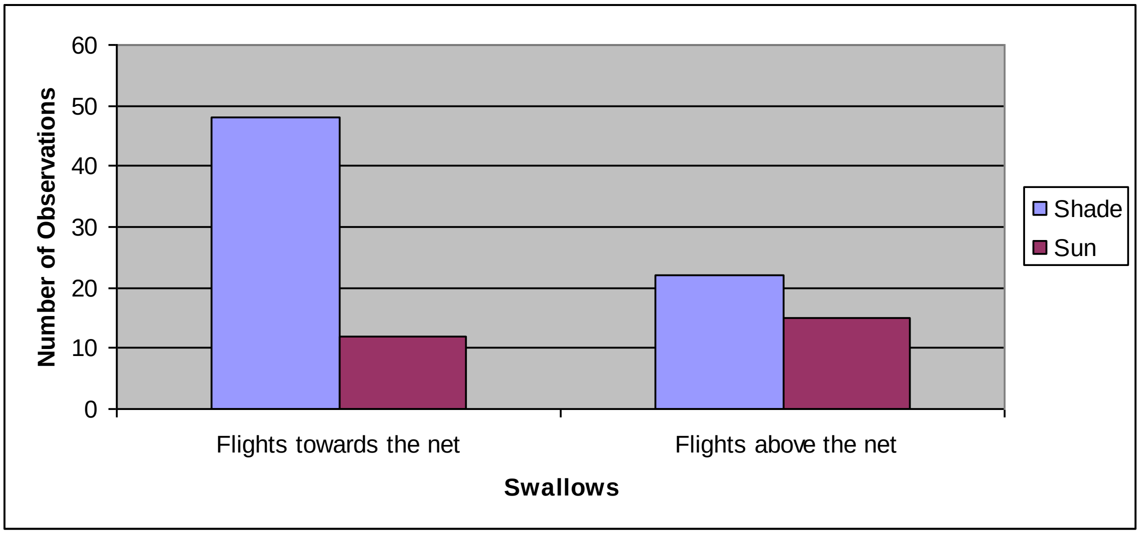

Figure 2. Number of swallows observed flying above the net or towards the net (including all evasions, successful net captures and unsuccessful net captures) under sunny or shady conditions.

The total evasion rate and capture rate were calculated for common species and for families in the case of low sample sizes, such as the Emberizidae (Fig 3). Capture rate was calculated as successful captures divided by total flights toward the net [S/(E+U+S)], and differed significantly from random (Pearson's chi-square test, $p < 0.001$). Yellow Warbler (*Dendroica petechia*) and Baltimore Oriole (*Icterus galbula*), although included in Fig 3, were omitted from analysis due to small sample size. The data strongly indicate a difference in evasive behaviour between species or families, contrary to the findings of Jenni et al. (1996) in a similar study. Although our sample sizes for some taxa were small, anecdotal observations and previous studies support the patterns recorded. For example, the high evasion rates of swallows are consistent with MacArthur and MacArthur's (1974) description of their aerial capabilities. Others, like sparrows, are 'dumb' (MacArthur and MacArthur 1974) and this is reflected in their significantly lower evasion rates. Therefore, species-specific or family-specific evasion rates are another factor that affects the capture rates of birds and should be considered in the analysis of mist-netting data. In the case of this study, many of the Yellow Warblers and Song Sparrows were likely local birds that habituated to the presence of the nets; a comparison between primarily resident and primarily migrant Parulidae and Emberizidae might show a lower evasion rate among those just passing through the area. Further study at MBO is recommended.

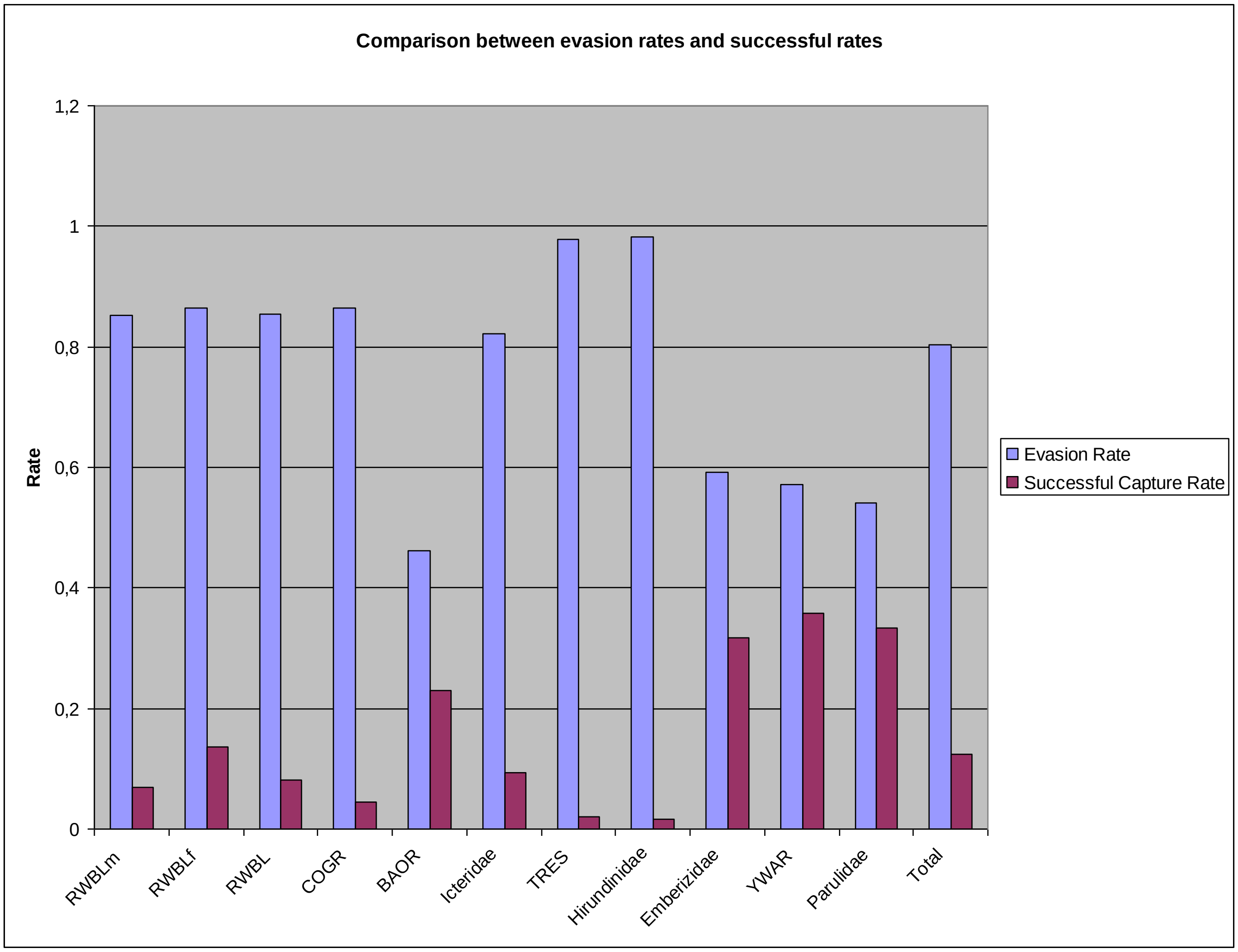

Figure 3. Evasion rates (in blue) and successful capture rates (in red) of Red-winged Blackbird males (RWBLm), Red-winged Blackbird females (RWBLf), Red-winged Blackbirds (RWBL), Common Grackles (COGR), Baltimore Orioles (BAOR), blackbirds (Icteridae), Tree Swallows (TRES), swallows (Hirundinidae), Yellow Warblers (YWAR), wood-warblers (Parulidae) and the total number of birds

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