Mist netting success in relation to weather

By Susan E. Quinlan and Roger L. Boyd

Introduction

Mist nets have often been used to quantify avian populations; however, as Ralph (1976) has indicated, there are possible variables that need to be corrected for. Ralph (1976) provided a method to adjust for unequal net-hours of operation to equalize comparisons between banding operations and proposed the use of correction values for varying lengths of time for which the nets were run. These correction values are based on the assumption that capture rates do not vary significantly over time. The number of birds actually captured, however, depends at least partially on two variables: the amount of bird activity and the visibility of the nets. If birds are extremely active more birds will be captured. Or, if high humidity makes nets more visible, as suggested by Stewart (1971), fewer birds will be caught. Stewart found that peak mist net captures on cloudy days are significantly later than on sunny days. This implies that weather affects bird activity or mist net visibility. The purpose of this study is to determine if mist netting success is affected by the weather.

Method

Research was conducted in Spring Creek Canyon, a small area of cottonwood habitat, 9.6 km southwest of Fort Collins, Colorado. Black, 12 m-long mist nets with a mesh size of 3.75 cm were operated over two periods of ten consecutive days in the springs of 1973 and 1975. In all, over 450 birds of 42 species were banded. Nets were operated until 0930 hours each morning, and again from 1800 hours until after dark each evening. Time of capture, species, age and sex classification, when possible, were recorded before the bird was banded and released. Eleven nets were operated in 1973 and six in 1975. The six nets used in 1975 were in the same locations as six of the nets in 1973. The larger number of nets used in 1973 reflected utilization of a larger portion of the Spring Creek Canyon and did not indicate a greater number of nets in the same area.

Most weather data were obtained from the Colorado State University Experiment Station located 9.6 km northeast of the research site. Positions of pressure systems and weather fronts were obtained from the Daily Weather Maps published by the National Oceanic and Atmospheric Administration.

Number of birds captured during the morning hours were compared to the weather variables at 0700 hours using a simple Pearson correlation statistical test. Weather variables include temperature, barometric pressure, cloud cover, humidity and wind speed.

Since most passerines migrate at night (Lack 1960, Kendeigh et al. 1960, Nisbet and Drury 1968, and Able 1973), the numbers of birds migrating through an area would be affected by the weather during the night. To determine if capture success was related to migration movements, the numbers of birds mist netted on a given day was compared to pressure system and weather front locations and to individual weather variables at 0100 hours on the previous night.

Results and discussion

Temperature, barometric pressure, and cloud cover were associated significantly (AOV, $P<1.05$) with the number of birds captured. Wind speed and humidity did not show any correlation above the .2 confidence level, again using analysis of variance.

Temperature indicated a strong negative correlation with netting success at the 0.044 confidence level. Thus, high temperatures were associated with low captures. Since the visibility of nets would probably be unaffected by temperature alone, we assumed that temperature might be affecting the activity period of birds. Eyster (1954) studied the activity period of captive songbirds and found that temperature plays a significant role in regulating the beginning and end of a bird's daily activity period. Although he observed some variation among species, Eyster found that an increase in temperature beyond a given point (normally 25°C) was generally associated with the end of the morning activity period. If these same associations occur in wild birds, the end of the morning activity

period would occur at an earlier time on mornings with temperatures above 25°C than on cooler mornings. Since the nets were operated until the same local standard time each morning, a variation in length of bird activity periods would be expected to cause a change in number of birds captured. As might be expected based on Eyster's observations, low temperatures correlated with high capture success, and high temperatures correlated with low capture success. This appears to be a plausible explanation for the correlation observed between temperature and captures.

Barometric pressure was positively correlated with the numbers of birds captured at a significance level of 0.037. The reason for this correlation is not apparent. Barometric pressure does not affect the visibility of the nets, so again, the possibility of correlations with the activity period was investigated. There was no reference found in the literature directly relating barometric pressure to activity periods of birds; however, one possibility is that periods of high barometric pressure are also periods of unfavorable weather conditions for migration (e.g., winds from the wrong direction [Richardson 1971]). An increased number of captures during these periods of unfavorable migrating conditions could be due to the birds "holding over" in the study area until more favorable conditions for migration occur. More research is needed to verify or refute the existence of such phenomena along the eastern slope of the Colorado Rocky Mountains.

Cloud cover was also positively correlated with mist nettings success at a 0.065 significance level. Stewart (1971) found that cloud cover caused an hour delay in the peak of mist net captures. However, since the nets were operated past the times of peak capture reported by Stewart, this relationship should not affect the results. Most probably visibility of nets is affected by the amount of sunshine. Reflection of light, and thus net visibility, will increase with the amount of sunlight. Thus, nets would be less visible on cloudy days, and capture success would be greater than on sunny days. This would explain the positive correlation observed between netting success and the amount of cloud cover.

No significant correlations between wind speed or humidity, 0.314 and 0.358 respectively, and capture success were observed. Both of these variables would be expected to increase the visibility of nets at some high level (i.e. 32 km per hour winds, or relative humidity approaching 100 percent). However, such extremes were not observed during this study.

According to many researchers (Kendeigh et al. 1960, Lack 1960, Bagg 1965, Richardson 1971, Able 1973, and Emlen 1975) migration movements of birds are affected by weather variables. The possibility was considered that the results in this study might only reflect the number of migrants in the study area. Thus, the number of birds captured was compared with weather variables on the previous night when passerine migration would have occurred. As shown in Table I, no significant correlations were observed at the 0.10 confidence level.

Table I. Correlation statistics resulting from comparison between the numbers of mist netted birds and the weather variables at 0100 hours.

Statistics	Weather variables				
	Temperature	Wind speed	Barometric pressure	Cloud cover	Relative humidity
Correlation Coefficient	+.0570	+.0350	+.0980	+.1980	+.0234
Significance Level	.717	.850	.560	.219	.890

Conclusions

The results of this study show that mist netting success is affected by weather conditions along the eastern slope Colorado foothills. Thus, mist nets do not give an accurate estimate of the relative daily abundance of small land birds, as assumed by Ralph 1976, Baird et al. 1958, and Baird et al. 1959. However, if used over a longer period of time, as Weise (1971) did, the variations in netting success due to weather might be overcome. Also, it should be pointed out that the use of mist nets in calculation of a Lincoln-Peterson index to population size, as suggested by MacArthur and MacArthur (1974), would be severely limited by the effects of weather on mist netting success.

Summary

This study compares number of mist netted birds with weather conditions. Simple correlation statistics show associations between capture success and temperature, barometric pressure, and cloud cover. These correlations are explained by the effects of these weather variables on net visibility and bird activity. No significant correlations were found between capture success and humidity and wind speed.

The possibility that these correlations might result from variations in numbers of migrants arriving

with certain weather conditions is explored. However, no significant correlations were found between the number of mist netted birds and weather variables during the night, the time at which most passerine migration occurs.

Acknowledgements

The authors are grateful to Jenifer S. Slater for her assistance in operating the mist nets in 1975. Further, we gratefully acknowledge the assistance of the Colorado State University Experiment Station personnel and Dr. John F. Benci for their assistance in collecting and interpreting weather data. Personnel of the Statistics Library were also helpful in retrieving computer subroutines for use in data analysis. Dr. Ronald A. Ryder provided valuable assistance in reviewing the manuscript.

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