Muscicapa striata	Grauschnäpper	Spotted Flycatcher
Anthus trivialis	Baumpieper	Tree Pipit
Anthus pratensis	Wiesenpieper	Meadow Pipit
Motacilla alba	Bachstelze	White Wagtail
Motacilla flava	Schafstelze	Yellow Wagtail
x *Lanius senator*	Rotkopfwürger	Woodchat Shrike

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A Simple method for estimating the racial composition of a sample of migrants away from the breeding grounds

By M. A. Thake

The purpose of this contribution is to point out the existence of a simple method for estimating the racial composition of a sample of birds on the basis of a set of routine measurements commonly made in the course of ringing.

Consider a variate W (eg. winglength, tarsus length, tail length, etc.) whose mean is different in a number of subspecies or races. The population at an intermediate point through which all the races migrate will have a mean value which is a weighted linear combination of the means of the various races. Thus the expectation of W, E (W) is given by

$$E(W) = \sum_{i=1}^{m} p_i \quad E(W_i) \qquad (1)$$

where pi is the proportion of race i, and E (Wi) is the expectation of variate W for the i^{th} race. The sample mean $\bar{W}$ may be used as an estimator for E(W) while the mean $\bar{W}i$ of the race in question may be used as an estimator for E(Wi). What is obtained is an equation with m unknowns. Provided a number of variates are available which differ significantly among the races, the resulting simultaneous equations may be solved to obtain values for the various pi.

Confidence limits for the various pi values depend on the variances of all the means employed. Where m = 2 and the means for the two races are based on very large samples, confidence limits may be determined quite readily by finding values of pi given by the confidence limits for $\bar{W}$, ie.

$$\bar{W} \pm \frac{1.96 \sqrt{(N-1)}\, s}{N} \qquad (2)$$

where /s is the sample standard deviation, and N is the sample size.

There are a number of inadequacies of the method which should be kept in mind. An implicit assumption is that the populations in question are homogeneous and intergradation is unimportant. The mean is assumed not to vary over the range of a given race. The above method is unsuitable for analysing the components of a cline.

Much of the literature data on biometric means are based on too few museum specimens. The method is thus hampered as much by the uncertainty of the literature means as by the necessity for employing fairly large samples. Moreover means obtained from museum specimens may be biased. Thus winglength is likely to be consistently underestmated due to shrinkage of preserved skins (see PRATER et al. 1977). Extensive biometric data obtained under field conditions are to be preferred where these are available.

Example

WARDLAW RAMSAY's (1923) record of two *Sylvia cantillans albistriata* from Malta raised the possibility that two races of the Subalpine warbler occur locally, *S. c. cantillans* and *S. c. albistriata.* BANNERMAN & VELLA GAFFIERO (1976) were sceptical about the possibility of distinguishing between the races. GAUCI & SULTANA (1976), correcting an earlier statement (SULTANA et al. 1975), suggested that *S. c. albistriata* occurs at least as frequently as the nominate race. Data published in GAUCI & SULTANA's (1976) paper are used to calculate best estimates of the proportions of *S. c. cantillans* and *S. c. albistriata* occurring in Malta.

The North African race *S. c. inornata* was not considered in the calculations as it has not been recorded from Malta. Other trans saharan migrants which breed in North Africa are rare in Malta. Its measurements are similar to *cantillans* (WILLIAMSON 1968) and its occurrence is likely to affect the proportion of that race alone.

Values for mean winglength of *cantillans* (Wc) and *albistriata* (Wa) taken from WILLIAMSON (1968) were substituted in equation 1 to obtain values for the proportions of *cantillans* (pc) and *albistriata* (pa) in the sample. The mean winglength of the sample (60.2 mm) is given by $\bar{W}$ = pa Wa + pc Wc, where pa + pc = 1.

By this means *S. c. albistriata* is estimated to constitute 72.8% of the Subalpine warblers on migration through Malta. The above estimate is probably too high by an unknown amount due to shrinkage of the museum specimens measured, and the calculations should be repeated when winglength parameters obtained from extensive measurements of live birds become available.

The method employed here might allow the migrations of separate races to be traced during a season, sample size permitting.

Zusammenfassung

Eine einfache Methode zur Abschätzung der rassenmäßigen Zusammensetzung von Fänglingen auf Durchzugsstationen

Es wird eine Möglichkeit beschrieben, aus den auf Beringungsstationen gewonnenen morphologischen Daten den anteilmäßigen Durchzug verschiedener Rassen oder Populationen einer Art abzuschätzen. Mit der Voraussetzung, daß sich die Rassen oder Populationen einer Art in den Mittelwerten morphologischer Merkmale (z.B. Flügellänge, Lauflänge etc.) unterscheiden, kann mit Formel (1) bestimmt werden, mit welchem Anteil die einzelnen Rassen oder Populationen auf Fangstationen auftreten. Dieses Verfahren ist jedoch nur dann durchführbar, wenn den untersuchten Merkmalen keine Kline zugrunde liegt. Als Beispiel wird aus der mittleren Flügellänge auf Malta durchziehender Weißbartgrasmücken *(Sylvia cantillans)* der Anteil von durch Malta ziehender *S. c. albistriata* und *S. c. cantillans* abgeschätzt.

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Anmerkung der Redaktion: Von 2 Referenten vorstehender Arbeit wird hervorgehoben, daß das vorgeschlagene Rechenverfahren wegen der vielen Voraussetzungen, die für seine Anwendung erfüllt sein müssen, nur in sehr speziellen Fällen Anwendung finden kann. Eine einigermaßen verläßliche Zuordnung von Individuen aus Mischpopulationen zu bestimmten Rassen erfolgt besser durch die Diskriminanzanalyse, die allerdings einen vergleichsweise größeren Rechenaufwand erfordert: Analyse der Ausgangspopulationen (z.B. anhand von Museumsmaterial) und Zuordnung der Individuen mit Angabe der Zuordnungswahrscheinlichkeit.