Validity of the fifth primary pattern as a distinguishing feature in Eurasian Whimbrel Numenius phaeopus subspecies, with particular emphasis on Steppe Whimbrel N. p. alboaxillaris

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Summary: This paper assesses the use of the patterning of P5 and P6 in distinguishing Steppe Whimbrel *Numenius phaeopus alboaxillaris* from Eurasian Whimbrel *N. p. phaeopus* as proposed by Allport (2017) and Campbell *et al* (2022). Examination of 125 Whimbrels, including specimens of *N. p. variegatus,* demonstrates that the range of variation is greater than depicted in field guides and that the various subspecies show considerable overlap in this feature.

INTRODUCTION

Understanding the non-breeding distributions of rare taxa requires reliable field identification criteria. Unfortunately, it is often difficult to know with a reasonable degree of confidence that character states or combinations of character states are diagnostic. To exclude the possibility that purportedly diagnostic character states, or combinations thereof, show overlap between taxa, it is important that intra-taxon variation is quantified using a sufficiently large sample of individuals (Sangster 2021). Not surprisingly, quantitative studies of bird identification characters using large samples has demonstrated that individual variation and overlap between taxa may be greater than previously assumed (*eg* Adriaens & Gibbins 2016, Jansen & Corso 2023, Jansen & Driessens 2023).

Steppe Whimbrel *Numenius phaeopus alboaxillaris* is generally still recognised as a valid taxon (*eg* Tan *et al* 2023) with very few records outside its Central Asian breeding range. The patterning of the fifth primary (P5) has been proposed as an additional feature for identifying *alboaxillaris* from Eurasian Whimbrel *Numenius phaeopus phaeopus* (Allport 2017, Campbell *et al* 2022). Here I examine museum specimens to assess whether this is a reliable identification feature.

METHODS

I examined the presence on P5 of (i) white spots/marbles on the outer web, and (ii) white on the tip (Figure 1). To be able to detect a non-diagnostic character state that occurs in the population at a frequency of 0.05 ('95% diagnosability') with a confidence level of $P < 0.05$ (a standard acceptable error rate in statistics; Sangster 2021), I examined 59 labelled individuals of *phaeopus*. In addition, seven specimens of *alboaxillaris* were examined, all collected from the wintering area (the type specimen was not examined for this research but was collected in Mozambique). For completeness I also included 59 labelled specimens of Siberian Whimbrel *Numenius phaeopus variegatus*. Additionally, I examined P6 to establish whether the spectrum of variation is as broad as it is in P5. Most illustrations (*eg* Hayman *et al* 1986, Duivendijk 2022) show only limited variation in P6.

Specimens were examined at Naturalis Biodiversity Center, Leiden, Netherlands (Naturalis), Muséum national d'Histoire naturelle, Paris, France (MNHN) and Natural History Museum, Tring, UK (NHMUK).

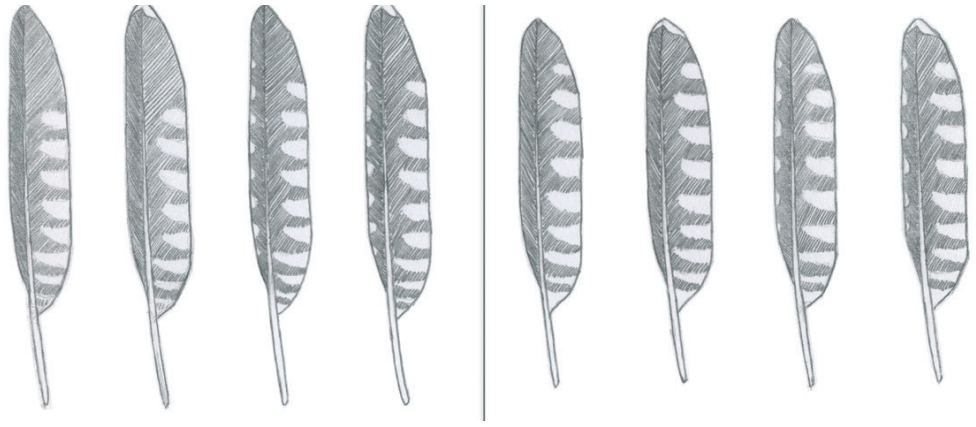

Figure 1. Variation in pattern of P6 (left four) and P5 (right four) in *Numenius phaeopus*. Four types of feather patterns are identified: one without a white tip or spots on the outer web (left), one with a white tip but no spots on the outer web (second left), one with no white tip but with spots/marbles on the outer web and (second right), and one with a white tip and spots/marbles on the outer web (right).

RESULTS

Specimens of *phaeopus* and *variegatus* exhibited considerable variation in the pattern of the outer webs and coloration of the tip of both P5 and P6 (Table 1). Although all seven *alboaxillaris* showed a combination of clear white spots on the outer web and a white tip of P5, this was also the most common combination of states in *phaeopus* (62% of specimens of this taxon) and *variegatus* (80% of specimens). Thus, the presence of (clear) white spots on the outer web of P5 does not reliably distinguish *alboaxillaris* from either *phaeopus* or *variegatus*. P6 was found to be even more variable, and subspecies could not be distinguished using variation in this trait (Table 1). The patterns are not age- or sex-related (both were tested). Therefore, it is important to quantify other putative identification characters, and combinations thereof, in distinguishing between Eurasian Whimbrel taxa.

This study underscores the importance of (i) quantifying individual variation, (ii) using large samples of reference material, and (iii) using variation in multiple character states to identify potentially diagnostic combinations of character states (Sangster 2021).

Another issue that deserves attention is the risk of deriving identification criteria of poorly known taxa from birds observed well outside their putative breeding range (like the type specimen of *alboaxillaris*), especially if those 'reference' birds were identified using the same criteria (circularity). This underscores the importance of 'ground-truthing' identification criteria: to base new identification criteria on reference material that is known to be correctly identified (*ie* using empirical evidence of the identity of the birds) as opposed to information generated by inference.

Table 1. Combinations of features as shown in Figure 1. The numbers shown are the number of specimens that show each of four combinations on P5 and P6 for three taxa. 0/0 = no white tip, no spots on the outer web; 1/0 = white tip but no spots on the outer web; 0/1 = no white tip but spots on the outer web; 1/1 = both white tip and spots on the outer web.

P5	*phaeopus*	*variegatus*	*alboaxillaris*
0/0	6		
1/0	16	10	
0/1		2	
1/1	37	47	7

P6	*phaeopus*	*variegatus*	*alboaxillaris*
0/0	16	20	2
1/0	38	26	4
0/1			
1/1	5	13	1

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