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On the validity of *Sitta villosa corea* Ogilvie-Grant, 1906, from the Korean Peninsula, SW Ussuriland and NE China

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ABSTRACT Sixty specimens of the Chinese Nuthatch *Sitta villosa* from seven different collections revealed a well-defined divergence in body coloration between isolated populations of N China (*villosa sensu stricto*) and northern Korea to SW Ussuriland (the so-called 'corea' form). The 'corea' population is paler at all seasons. On that basis, even though the difference in wing-length between populations reported by other authors was not found to be significant, we recommend recognition of *Sitta villosa corea* Ogilvie-Grant 1906 as a valid subspecies.

KEY WORDS China, Chinese Nuthatch, coloration, geographical isolation, Korean Peninsula, *Sitta villosa corea*, Ussuriland.

INTRODUCTION

The Chinese Nuthatch *Sitta villosa* currently inhabits a transitional belt between the forest biota of East Asia and the steppe and desert biota of Inner Asia (Fig. 1; cf. Nazarenko 2006: 266). This terrain is characterized ecologically by its diverse topography, huge climate range and two millennia of human impact. Typically, it features mountain 'islands' of woodland and patches of conifer trees (Meng Lihua *et al*. 2007, Ren & Beug 2002, Wang Chiwu 1961). Rather than inhabiting the interior of closed-canopy, lowland forest tracts, Chinese Nuthatch selects just these upland 'islands', preferring loose stands of conifers and, exceptionally, larger parks (Fiebig 1992, Nazarenko 2006). As an outcome, the whole species' range is broken into numerous localized pockets of population (Fig. 1). For an assessment of geographical variation, especially for checking whether clines of variation occur (cf. Harrap 1996: 142), specimens from representative Korean, Ussuriland and Chinese populations were all included in the data set.

The validity of Ogilvie-Grant's (1906: 87) proposed form *corea* as a distinguishable subspecies of *Sitta villosa* was contested by Vaurie (1959: 529), and recent taxonomy treats this name mostly in the synonymy of nominate *villosa* Verreaux, 1865 (cf. Dickinson 2003: 646, Fiebig 1992: 152, Greenway 1967: 137, Harrap 1996: 142, Li Guiyuan *et al*. 1982: 70–74). Vaurie (1959) considered the morphological differences between nominate *villosa*, type locality given as 'China north of Peking', and *corea*, type locality 'Mingyong, 110 miles south-east of Seoul' (Vaurie 1959 and Nazarenko 2006 link this with today's Mungchong-dong, South Korea, at 36°08'N: 127°45'E), as too minor to warrant subspecific recognition. However, Simon Harrap (Harrap 2008: 135) has since revived the name *corea* for the population of the Russian Far East, NE China and extreme northern Korea, although rarity of museum skin material from NE China and the Korean Peninsula has been a major problem for assessment of the species group (Nazarenko 2006). Here, we include new material from collections previously not considered, and present the largest data set so far analyzed.

We commenced this study some years ago while investigating the recent expansion of breeding *Sitta villosa* into SW Ussuriland, and the question as to which population

these birds might belong. Some comparative material was collected locally (Nazarenko 1988, 2005), but to solve the question of subspecies identity in Ussuriland it became essential to include in the data analysis specimens from central northern China on one hand, and of NE China and northern Korea on the other. These two populations are considered geographically disjunct (Lei Fumin & Lu Taichun 2006, Nazarenko 2006), see Fig. 1, and this paper investigates whether they differ morphologically to a degree sufficient to support subspecific treatment. Nazarenko (2006) estimated the range gap between populations to be about 300 km of probably originally mainly treeless lowlands (cf. data in Lei Fumin & Lu Taichun 2006).

METHODOLOGY

Because Vaurie (1959) and Harrap (1996) pointed out that the major differences between nominate *villosa* and '*corea*' are body coloration ('*corea*' being paler) and size ('*corea*' smaller), we focused on these characters. Preliminary studies showed that the coloration of lower parts (i.e., breast, flanks, belly and vent) suffers considerable seasonal change, being lighter and more colourless during the breeding season (April–July) due to feather wear, and comparatively duller during the winter season (August–December). This made it necessary to study breeding and post-breeding season specimens separately.

We took digital photographs (together with a Kodak standard colour chart for comparison) and, because the images were taken by different people and different cameras under different light conditions, applied a colour correction programme used at the publishing house 'Apelsin' of Vladivostok. Also, in non-moulting individuals, both right and left wing-lengths (carpal joint to longest flight-feather, straightened) were measured by a total of four different persons; personal measurement bias effects subsequently minimized using STATISTICA software. When the length of

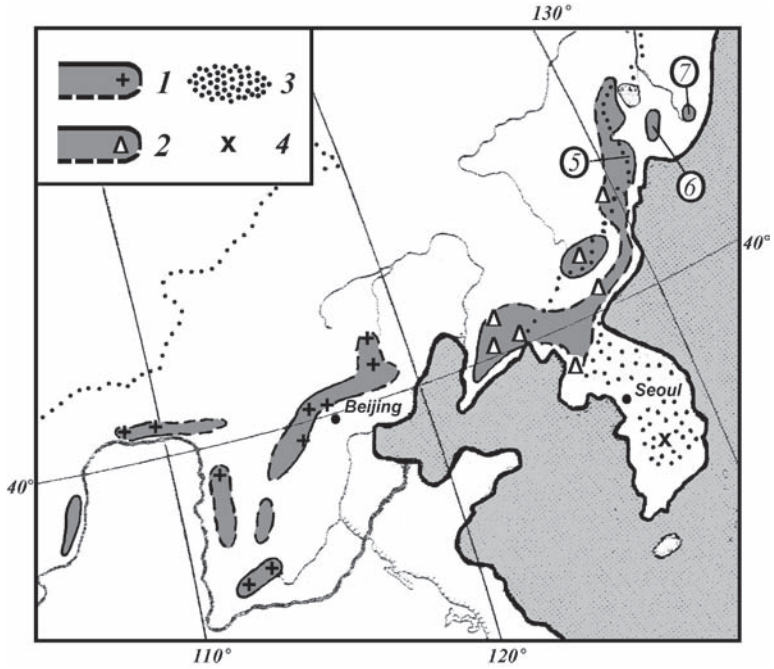

Figure 1. Map of the known breeding range of the Chinese Nuthatch *Sitta villosa* (from: Lei Fumin & Lu Taichun 2006; Nazarenko 1988, 2005, 2006; Tomek 2002, with refinements, see text). Key to numbers: 1. Range of *S.v. villosa*. 2. Range of *S.v. corea*. 3. Known wintering grounds of *corea* outside of its breeding range. 4. Probable type locality of *corea* (see text). Isolated localities in Russia: 5. Shufan. 6. Lefu. 7. Muta (see Appendix).

the right wing differed from the left the mean measurement of the two was used. Obtained means differed somewhat from values given in the literature, and this we comment on in the conclusion.

Altogether, 60 specimens from seven different collections were studied (see: Acronyms and Appendix).

RESULTS

Body coloration

Nominate *villosa* and '*corea*' differ only in the colours of the lower parts: breast, belly, and flanks to vent. The *corea* population in breeding condition shows these as uniform dull Pale Neutral Grey (Smithe 1975, colour 86) with a wash of Drab-Grey (colour 119D), and females show more of a sandy tinge than males. The dull-whitish colour of the chin and throat is not sharply demarcated from the colour of the breast (Plate 9, images 1–10). In post-breeding plumage the underpart colour approaches darkish Saffron (colour between 123A and 38) and pale greyish Cinnamon (colour 39), becoming more darkish sandy and Tawny Olive (colour 223D) towards the flanks and belly. Whitish chin, cheeks and throat contrast rather well with the darker breast and belly (Plate 9, images 19, 21; Plate 11, image 18).

By contrast, birds of the *villosa* population are in all seasons darker on the underparts. The whitish throat patch is more restricted and has a Tawny Olive tinge (colour 223D). Plate 10 (images 14–17 *corea* and 23–27 nominate *villosa*) compares the plumage in breeding condition. Towards the sides of the breast, flanks and belly the colour of nominate *villosa* grades to Greyish-Olive (colours 43–45) (see Plate 10, images 28–31 and Appendix). In post-breeding plumage, all colours are more saturated, and some specimens of nominate *villosa* then show no white on the throat (Plate 11, images 18 *corea*, 42–44 nominate *villosa*). A third named form, *bangsi* Stresemann, 1929, from north-central China, is the darkest population, in which the non-breeding plumage belly and vent are Raw Umber (colour 123; based on the type specimen ZMB 27.519 and 12 additional specimens).

Wing-length

No statistically significant difference in wing length was found between the populations within the range N China and northern Korea to SW Ussuriland (see Appendix).

Male *S. v. villosa*: n = 16, mean = 64.994 ± 1.9 (61.5–68.1) mm, C_v = 2.9.

Male '*corea*': n = 24, mean = 64.775 ± 1.8 (60.8–68,9) mm, C_v = 2.8.

Student's criterion: t = -0,37, P = 0.72.

Female *S. v. villosa*: n = 13, mean = 63.477 ± 0,9 (62.0–65.0) mm, C_v = 1.4.

Female '*corea*': n = 6, mean = 63.783 ± 1.5 (62.0–65.0) mm, C_v = 2.4.

Because of the small size of the *corea* sample, and Cv divergence, no t-test was applied to females.

The absence of biometric differences in wing and also tail lengths had already been noted by Fiebig (1992), in a series of 28 specimens from central-north China and northern Korea.

CONCLUSION

Taxonomic assessment of the '*corea*' population

Comparison of specimens from N China with those from northern Korea and SW Ussuriland has shown a constant divergence in coloration of the underpart plumage, season for season, and despite practically no difference in body size, as measured by wing length, we regard this as sufficient to confirm the existence of a subspecies *S.v. corea*.

The holotype of *corea* (BMNH 1907.12.290, see Plate 12, image 22), an adult post-breeding male, was collected by Malcolm P. Anderson on 30 November 1905 '110 miles south-east of Seoul, Korea' (Warren & Harrison 1971: 131). Information on Anderson's movements in the south and south-eastern territories of the Korean Peninsula during 1905 is extremely scarce (Austin 1948: 11), and we find a discrepancy in the literature concerning the type locality of *corea*. The type derives either from territory adjacent to north Chungchong

Plate 9. Underpart coloration of specimens from Ussuriland at different seasons. Nos.1–10 breeding plumage (10 is female), Nos. 19 and 21 late August adults in fresh post-breeding plumage, No. 60 a fully grown young male of late June (see text and Appendix).
(Photograph: S. Surmach).

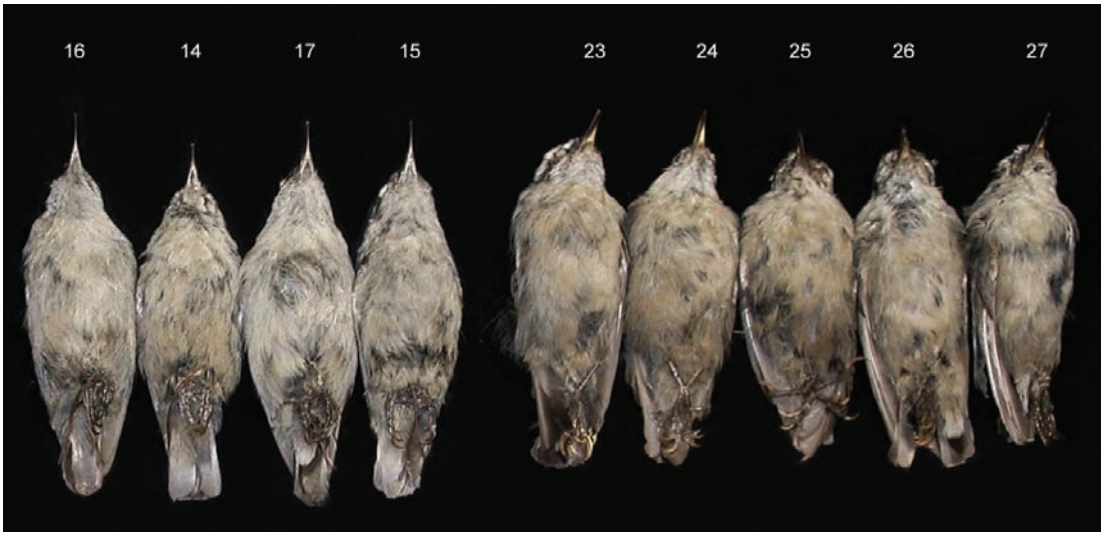

Plate 10. Underpart coloration of specimens in breeding season from northern Korea: Nos. 14–17, in comparison to specimens of nominate *villosa* from Beijing, N China, Nos. 23–27 (see text and Appendix).
(Photograph: F. Steinheimer).

(Austin 1948: 197; = Mungchong) or from north Kyongsang province (Ogilvie-Grant 1906). The name Mingyong (Ogilvie-Grant 1906; Vaurie, 1959: 529) could neither be traced in the current world gazetteers nor from any internet source, whereas the settlement Mungchong (see Austin 1948) exists: it is the Mungchong-dong district of Yongju City, 36°50′N, 128°37′E, 170 km (105.6 miles) south-east of Seoul (information from Dr Victor Ryashentsev, specialist in Korean Studies). Thus, we follow Austin (1948) and herewith formally restrict the type locality of *corea* to modern Mungchong-dong, Yongju City, North Kyongsang Province, South Korea. The

Plate 11. Underpart coloration of specimens in post-breeding plumage from Ussuriland, no. 18, late August, in comparison to birds from North China, nos. 42–44 (see text and Appendix).
[Photograph: S. Surmach].

Plate 12. Holotype of *corea*, No. 22 dated 30 November 1905, compared with male No. 41 dated 28 December 1907 from Shanxi, N China (see text and Appendix).
[Photograph: K. van Grouw].

area is known for wintering birds of the *corea* population (e.g., Austin 1948: 197; Tomek 2002: 120–121). The holotype is atypically small, with a wing-length of only 62.0 mm (measurements taken by Katrina van Grouw, BMNH), against a population mean of 64.8 mm (see above). We see therein the reason why for a long time the Korean population was believed to be smaller than the nominate population, and the data of Stresemann *et al*. (1937: 512) showing an average of 66.2 (63–69) mm (n = 10) for nominate *villosa* probably supported this opinion even further. Tomek (2002: 121) listed the wing-length of Korean birds considerably larger: 66.0 (63–68) mm (n = 8) for males, and 64.4 (63–67) mm (n = 8) for females. Zheng Baolai (1982: 71), on the other hand, gave similar figures for nominate *villosa*: 64.7 (62.5–67.5) mm for males (n = 9) and (62.5–64.5) mm for females (n = 5).

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ACRONYMS

BMNH	The Natural History Museum, Tring.
FESU	Zoological Museum at Far East State University, Vladivostok.
IZAS	Institute of Zoology, Chinese Academy of Sciences, Beijing.
SMTD	Staatliches Museum für Tierkunde, Dresden.
WCNS	Working Collection of A. Nazarenko and S. Surmach, Vladivostok.
YIO	Yamashina Institute for Ornithology, Abiko City.
ZMB	Museum für Naturkunde an der Humboldt-Universität zu Berlin.

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APPENDIX

List of specimens used in this study

No.	Subspecies	Sex	Wing-length (mm)	Collection Date	Locality	Museum Acronym & Reg. No.	Collector
1	*corea*	M	68.9	17.05.1970	Muta	WCNS № 1	A.A. Nazarenko
2	*corea*	M	63.9	27.06.1970	Muta	WCNS № 2	A.A. Nazarenko
3	*corea*	M	63.5	29.06.1971	Shufan	WCNS № 3	A.A. Nazarenko
4	*corea*	M	62.8	09.06.1968	Muta	WCNS № 4	A.A. Nazarenko
5	*corea*	M	65.5	30.06.1971	Shufan	WCNS № 5	A.A. Nazarenko
6	*corea*	M	66.5	30.06.1970	Muta	WCNS № 6	A.A. Nazarenko
7	*corea*	M	65.3	16.06.2007	Lefu	WCNS № 7	A.A. Nazarenko
8	*corea*	M	65.4	19.06.2007	Lefu	WCNS № 8	A.A. Nazarenko
9	*corea*	M	64.3	18.06.2007	Lefu	WCNS № 9	A.A. Nazarenko
10	*corea*	F	64.2	25.06.1970	Muta	WCNS № 10	A.A. Nazarenko
11	*corea*	F	63.3	09.06.1968	Muta	WCNS № 11	A.A. Nazarenko
12	*corea*	F	62.4	18.06.2007	Lefu	WCNS № 12	A.A. Nazarenko

13	*corea*	M	64.6	08.05.1965	L. Pelis	FESU (II 2737/3256)	Yu.N. Nazarov
14	*corea*	M	66.9	30.05.1990	Pyongyang	ZMB 1990.127	J. Fiebig
15	*corea*	M	64.6	30.05.1990	Pyongyang	ZMB 1990.128	J. Fiebig
16	*corea*	M	65.9	02.05.1989	North of Pyongyang	ZMB 1990.126	J. Fiebig
17	*corea*	M	65.8	02.05.1989	North of Pyongyang	ZMB 1990.125	J. Fiebig
18	*corea*	M	66.5	25.08.2007	Lefu	IZAS	V.N. Sotnikov
19	*corea*	F	65.3	25.08.2007	Lefu	WCNS №19	V.N. Sotnikov
20	*corea*	M	64.5	25.08.2007	Lefu	WCNS №20	V.N. Sotnikov
21	*corea*	M	64.5	25.08.2007	Lefu	WCNS №21	V.N. Sotnikov
22	*corea* (holotype)	M	62.0	30.11.1905	Min-Gyong, 110 miles SE of Seoul	BMNH 1907.12.290	M.P. Anderson
23	*villosa*	M	67.9	11.03.1916	Peking (Hsiling)	ZMB 24.209	H. Weigold
24	*villosa*	F	65.0	11.03.1916	Peking (Hsiling)	ZMB 24.210	H. Weigold
25	*villosa*	F	62.8	10.03.1916	Peking (Hsiling)	ZMB 25.148	H. Weigold
26	*villosa*	F	64.0	10.03.1916	Peking (Hsiling)	ZMB 25.149	H. Weigold
27	*villosa*	M	–	29.04.1916	Jehol NE of Peking	ZMB 25.147	H. Weigold
28	*villosa*	F	64.7	30.04.1916	Jehol NE of Peking	SMTD C.23926	H. Weigold
29	*villosa*	M	68.1	10.03.1916	Peking (Hsiling)	SMTD C.32052	H. Weigold
30	*villosa*	M	63.9	25.02.1916	Peking	SMTD C.23924	H. Weigold
31	*villosa*	F	63.4	12.03.1916	Peking (Hsiling)	SMTD C.23925	H. Weigold
32	*villosa*	M	65.0	10.03.1916	Peking (Hsiling)	BMNH 1965-M-15757	R. Meinertzhagen
33	*villosa*	F	63.0	06.04.1902	Peking, Ming Tombs	BMNH 1914.815.371	F.W. Styan (p)
34	*villosa*	M	65.0	06.04.1902	Peking, Ming Tombs	BMNH 1914.815.372	F.W. Styan (p)
35	*villosa*	F	64.0	??.08.1968	Peking	BMNH 1881.5.1.4376	J. Gould
36	*villosa*	F	63.0	18.09.1868	Peking, Ming Tombs	BMNH 1898.9.20.967	R. Swinhoe
37	*villosa*	F	62.0	18.09.1868	Peking, Ming Tombs	BMNH 1898.9.20.968	R. Swinhoe
38	*villosa*	F	62.0	14.10.1867	Moupin	BMNH 1898.9.20.969	Pere David, ex R. Swinhoe coll
39	*villosa*	M	63.0	28.12.1907	Shan-Si (= Shanxi)	BMNH 1907.12.17.205	M.P. Anderson
40	*villosa*	M	67.0	28.12.1907	Shan-Si (= Shanxi)	BMNH 1907.12.17.206	M.P. Anderson
41	*villosa*	M	65.0	28.12.1907	Shan-Si (= Shanxi)	BMNH 1907.12.17.207	M.P. Anderson
42	*villosa*	M	63.6	12.09.1953	Hebei	IZAS 15016	not given
43	*villosa*	F	64.3	17.08.1917	NE Chihli	IZAS 23601	A. de C. Sowerby
44	*villosa*	M	65.3	04.08.1917	NE Chihli	IZAS 23599	A. de C. Sowerby
45	*villosa*	M	62.5	02.03.1956	Hebei	IZAS 45638	not given
46	*villosa*	M	64.4	03.04.1955	Hebei	IZAS 19105	not given
47	*villosa*	M	66.3	27.05.1962	Shan-Si (= Shanxi)	IZAS 43607	not given
48	*villosa*	M	64.4	24.05.1962	Shan-Si (= Shanxi)	IZAS 43608	not given
49	*villosa*	F	63.6	20.11.1916	Peking	IZAS 23600	Ch. Gayot (?)
50	*villosa*	F	63.4	20.11.1916	Peking	IZAS 23598	Ch. Gayot (?)
51	*villosa*	M	61.5	30.12.1955	Hebei	IZAS 45637	not given
52	*villosa*	M	67.0	19.10.1935	Alto Rian, Jehol	YIO 33968	H. Orii

53	*corea*	M	65.4	29.08.1929	Non Sayon, Korea	YIO 39967	H. Orii
54	*corea*	M	63.0	07.12.1917	North Korea	YIO 39969	not given
55	*corea*	M	60.8	??.08.????	North Korea	YIO 39970	H. Orii
56	*corea*	F	62.0	30.07.????	North Korea	YIO 39964	H. Orii
57	*corea*	M	66.0	07.08.????	North Korea	YIO 39965	H. Orii
58	*corea*	F	65.5	08.08.????	North Korea	YIO 39966	H. Orii
59	*corea*	M	62.0	30.08.2007	Lefu	WCNS № 22	S.G. Surmach
60	*corea*	M	66.0	30.06.1970	Muta	WCNS № 21a	A.A. Nazarenko