

## Systematic notes on Asian birds. 63. The eastern Asiatic races of *Sitta europaea* Linnaeus, 1758

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The Asiatic subspecies of *Sitta europaea* form an independent group of races which differ from the European subspecies by their smaller size and bill shape. Based on substantial samples of most of these taxa the present revision distinguishes 13 recognizable subspecies in the group. We remove from the group the subspecies *arctica* Buturlin, 1907, which is the most distinctive of all the Asiatic forms, because there is a zone of sympatry between this and *S. e. baicalensis* Taczanowski, 1882, where hybrid individuals may occur but if so must be extremely rare. We therefore support the elevation of *arctica* to full species level.

### Introduction

Previous authors have perceived as many as 40 subspecies in the polytypic Eurasian Nuthatch. These subspecies stretch from the British Isles and continental western Europe to the Pacific coast of Asia (Buturlin, 1916; Dunajewski, 1934; Voous & van Marle, 1953; Voinstvenski, 1954; Vaurie, 1957). Such studies included a number of South-Asiatic forms, representative of three groups: *nagaensis* Godwin-Austin, 1874 (*grisiventris* Kinnear, 1920, *nagaensis*, *montium* la Touche, 1899), *castanea* Lesson, 1830 (*almorae* Kinnear & Whistler, 1930, *cinnamoventris* Blyth, 1842, *koelzi* Vaurie, 1950, *neglecta* Walden, 1870, *castanea*, *tonkinensis* Kinnear, 1936), and *cashmirensis* Brooks, 1871. Most recently these have been considered to be best treated as independent species (Harrap, 1996; Dickinson, 2003, etc.). Clearly further study is still needed where these groups meet *Sitta europaea* L. *sensu stricto*, but here we have focused on the northern and eastern subspecies of the restricted species *S. europaea* and essentially on those of the eastern Palaearctic of which we have sufficient material.

Traditionally, the subspecies of the restricted *S. europaea* are also divided into three groups (Voous & van Marle, 1953; Vaurie, 1957, 1959; Harrap, 1996): 1) European brown-breasted forms – the “*caesia* Wolf, 1810, group” subspecies mainly inhabiting Europe and the Middle East; 2) white-breasted forms – the “nominative *europaea* group”, comprising forms distributed across the northern Palaearctic from the Scandinavian Peninsula to Kamchatka and the islands of Japan; 3) the “*sinensis* Verreaux, 1870, group”, occurring mainly in China, which differs from the other groups by the bright coloration of the underparts.

Our study is morphological, but we note in passing that placing nominative *S. e. europaea* in the same group as the white-breasted Asiatic forms would seem to be in-

correct in the light of the latest phylogeographic analyses and data on the spatial and reproductive relationships of this subspecies with a Siberian form *S. e. asiatica* Gould, 1835<sup>1</sup>. Mitochondrial DNA analyses (mainly, gene region ND2, 1041 nucleotide) revealed that at least 4 groups can be distinguished; their degrees of difference have been discussed elsewhere (Zink et al., 2006).

All morphological and mensural data used for present research reflect the phenotypic distinctiveness of the taxa, and nucleotide sequence distances suggest an absence of wide gene exchange between representatives of their groups.

<sup>1</sup> For reasons to date this 1835 see Dickinson (2006, this volume).

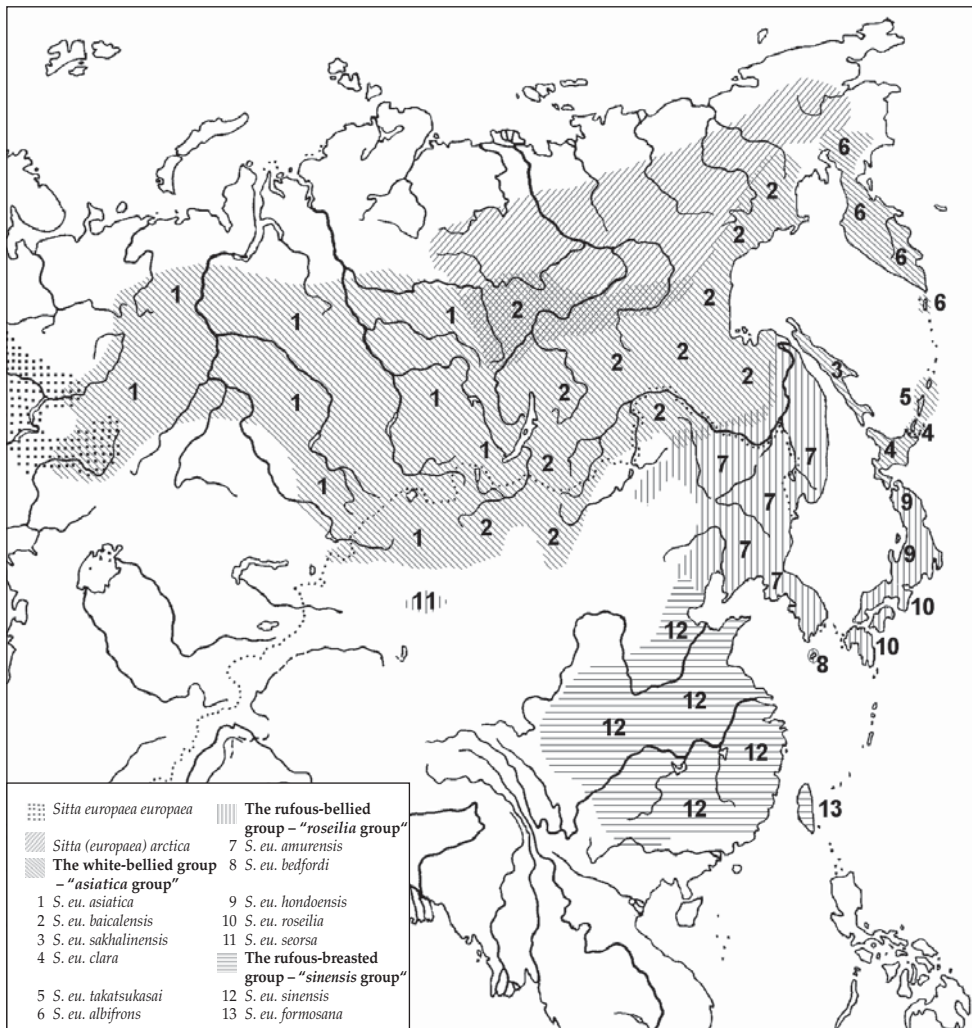


Fig. 1. Distribution of the Eurasian Nuthatch in Asia.

Our investigations suggest that there are two small zones of overlap between the ranges of nominate *europaea* and *asiatica* in the east of European Russia – in the south part of the Ural Range and in the lower basins of the Kama and Vyatka rivers. In the rest of the Urals and in nearby regions these forms are disconnected spatially (Fig. 1).

Although hybridization between them does take place, it is extremely local and does not significantly influence the phenotypes of the neighbouring “pure” populations of the two forms, so there is no intergrading zone of the type that is characteristic for subspecies or geographical races. This is why logically *S. e. europaea* could be included in the European group together with rufous-bellied *S. e. caesia*. Indeed there is a wide zone of clinal transition of features between these two, a number of more or less intermediate phenotypes being known from that region, and these have been described earlier under the names *sordida* Reichenow, 1907, *homeyeri* Hartert, 1892, and *sztolcmani* Domaniewski, 1915. Among the Asiatic ‘subspecies’ only *artica* stands out due to various characteristics described and discussed later (Buturlin, 1916; Dunajewski, 1934; Voinstvenski, 1954). These morphological differences are supported by the evidence from mitochondrial DNA sequences (Zink et al., 2006).

### Materials and methods

This revision is based on comparative analysis of the external morphological features of the specimens in the collections of our own institution (ZMMU: 418 specimens of 11 Asiatic forms). We have also examined collections of nuthatches belonging to other institutions and to two individuals (see Table 1, ‘Acronyms’ and ‘Acknowledgements’).

Table 1. Geographical distribution with details of collections holding the specimens used for the measurements

Subspecies	Locations	Collections (see list of acronyms)
<i>S. (e.) arctica</i>	Yakutia, Anadyr river	ZMMU
<i>S. e. asiatica</i>	Eastern part of European Russia, Western Siberia, Krasnoyarsk region, Irkutsk region	ZMMU; ZISP; Department of Zoology and Ecology of the Moscow State Pedagogical University; Department of Vertebrate Zoology, Biological Faculty of Moscow State University
<i>S. e. baicalensis</i>	Southern Yakutia, Transbaicalia, C & E Mongolia, Khabarovsk region	ZMMU; SDM
<i>S. e. sakhalinensis</i>	Sakhalin I.	ZMMU
<i>S. e. clara</i>	Hokkaido, Kunashir and Shikotan Is.	ZMMU; IBSS; ZISP
<i>S. e. takatsukasai</i>	Iturup I.	ZMMU; IBSS; ZISP
<i>S. e. albifrons</i>	Kamchatka Peninsula, Koryak Highland, Penzhina River	ZMMU
<i>S. e. amurensis</i>	Southern part of Khabarovsk region, Primorskii region, NE China, Korea	ZMMU; SDM
<i>S. e. hondoensis</i>	Honshu I.	ZMMU; SDM; ZISP
<i>S. e. seorsa</i>	NW China (eastern Tian Shan)	ZISP
<i>S. e. sinensis</i>	C & E China	ZMMU; SDM; ZISP
<i>S. e. formosana</i>	Taiwan	ZMMU; ZISP

In total we have examined 902 specimens of 12 subspecies, including type specimens of *arctica*, *hondoensis* Buturlin, 1916, *formosana* Buturlin, 1911, *partiararia* Portenko, 1954, *sakhalinensis* Buturlin, 1916, and *seorsa* Portenko, 1955. We have not been able to examine specimens of *roseilia* Bonaparte, 1850, or *bedfordi* Ogilvie-Grant, 1909, and have had to depend upon their descriptions from literature.

The morphological characteristics of wing length, tail length, tarsus length, hind toe length, hind toe claw length, bill length, bill maximum height and bill width at the base, were analyzed. The wing length was measured when straightened to the maximum on the plate. The tail length was measured from the root of the middle pair of rectrices to the end of the longest pair of rectrices. The tarsus length was measured from the intertarsal joint to the lower edge of the last complete scale before the toes diverge. The hind toe claw length was measured along the chord. Bill length was taken along the culmen from the back edge of upper mandible to the tip (bill length from the forehead edge), and length of bill from nostril was taken from the distal edge of a nostril to the end of the bill. Altogether, we have measured 406 specimens of 12 subspecies (Tables 2 and 3). We have included separately details of total body length, wingspan, and weight from our own measurements and those of other collectors, for recently collected birds (Table 4).

The material for comparative analysis and description of coloration was chosen taking account of feather condition. Specimens in fresh plumage (collected after the end of post-breeding or post-juvenile moult), and those in worn plumage (breeding plumage, March – July) were analyzed separately. The scale of colours in Smithe (1975) was used for the descriptions of coloration.

The colour paintings (Plates V and VI) are by Dr E.A. Koblik, drawing on specimens in the ZMMU collection, except for the image of *S. e. seorsa* which was based on the detailed description and a photograph taken by us in 2004 of the holotype (ZISP) of this species. Black and white drawings (Figs. 2, 3, 4, 5) are by Y.A. Red'kin and based on ZMMU specimens; these are inserted at the end of the paper.

## Results and discussion

As stated above, nominate *europaea* should be placed in the western group of rufous-bellied subspecies. All the representatives of the eastern group can be called Asiatic forms because their collective breeding range stretches westwards only to the Ural mountains (Fig. 1). Bill shape is the most characteristic feature of Asiatic subspecies and distinguishes them from European forms. The bill of almost all eastern subspecies looks more or less up-turned due to a straighter culmen (on average) and to the more oblique gonys (Fig. 2). The majority of eastern forms are also smaller than European birds.

There are races with rufous underparts and others with white underparts in both the Asiatic and the European groups. White-bellied subspecies occupy the northern part of the range while the rufous-bellied birds are found further south. Some representatives of the Asiatic group have a transitional, bicoloured pattern, with the belly rufous but the breast always pure white. This pattern does not occur in any subspecies of the western group. Based on these distinctions Asiatic nuthatches can be divided into 3 groups; 1) white-bellied group – “*asiatica* group”, 2) rufous-bellied group – “*roseilia* group”, 3) rufous-breasted group – “*sinensis* group”.

Below we discuss and describe the 14 forms recognized by us, including *S. arctica*.

The white-bellied "*asiatica* group"  
(6 forms plus *arctica* for ease of comparison)

*Sitta europaea asiatica* Gould, 1835<sup>2</sup>

Small white-bellied birds. They differ from the adjacent nominate subspecies by being smaller and the chestnut tint on the sides of the underparts is less developed. They also differ by having the bluish-grey upper parts darker than they appear in *S. e. europaea*. Thus the overall coloration of *asiatica* shows a greater contrast between the upperparts and the underparts. Siberian birds, from further east, have a wider whitish spot on the forehead and light stripes on the side of the head. In fresh autumn plumage the distinctive feature of all white-bellied subspecies (excluding *arctica*) is the sharp whitish tips of the greater coverts, forming a narrow cross stripe on the wing.

In all Asiatic forms of the nuthatch sexual dimorphism is evident from the intensity of the colour of the under tail-coverts. In males these are usually intense reddish-brown (varying from Burnt Sienna to Chestnut), whereas in females the vent is paler rufous (varying from Cinnamon to Antique Brown).

Most birds have the whole of the remaining underparts pure white but females of this and other white-bellied subspecies (excluding *arctica*) often have a yellowish-ochre tint on the belly, with a variable intensity and width of distribution. Female specimens with the brightest belly can resemble birds of the rufous-bellied group, leading to published records suggesting that white-bellied nuthatches and birds belonging to the subspecies *amurensis*, Buturlin, 1916, occur in the same area, as suggested by Andreev (1974) as well as Buturlin. Some males have a yellowish-ochre tint on the belly, but this is very rare and less marked in degree.

Specimens of *asiatica* are among the smallest in the Asiatic complex, only *sakhalinensis* and *formosana* are smaller. The bill is rather short and the culmen only gently down-curved (Fig. 2). The hind toe is rather long, as in the majority of Asiatic forms (Fig. 4). On average it is 3 mm longer than its claw.

The distinctive features of this subspecies, the up-turned bill and the rather wide white supercilium, are very noticeable in the drawing of *Sitta Asiatica* in Gould (1835); its rufous, but not reddish-brown, vent colour, and the wide distribution of ochre coloration over the belly proves that it was a female specimen. The type locality, given as "Russia", combined with this illustration suggest that it was collected in the eastern parts of European Russia where nuthatches of this subspecies are frequently recorded in autumn and in winter during migration.

"*Sitta biedermanni*" Reichenow, 1907, described from the northern parts of the Russian Altai, and sometimes regarded as an independent subspecies (Buturlin, 1916), supposedly differs from more northerly Siberian birds by smaller size. However, the material (ZMMU) examined from different regions of the Russian Altai, Saur Range, Tannu-Ola Range and Mongolian Altai is as large as *asiatica* and its coloration is the same as that of the northern nuthatches.

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<sup>2</sup> Dated 1837 by Greenway (1967: 127) but see footnote attached to this reference in our list of references.

Range: *asiatica* occupies mainly western and central parts of Siberia. The western part of the range includes the Urals and the eastern edge of European Russia. In the south this form occurs in the Saur Range, Russian Altai, Sayan Mountains and Mongolian Altai. It is distributed eastwards to the southern parts of the Putorana Plateau, the lower valley of the Tunguska River, the Upper Lena and the western shore of Lake Baikal.

*Sitta europaea baicalensis* Taczanowski, 1882

A dark-coloured race, larger than *asiatica*. Upper parts bluish-gray, a bit darker than those of *asiatica*. The white pattern on forehead and above the black brows is on average less distinctive or completely absent. Also larger than *sakhalinensis*, and *clara* Stejneger, 1887<sup>3</sup>, while smaller than *arctica* and *amurensis*, and approximately the same size as *albifrons* Taczanowski, 1882. The bill is longer than that of *asiatica*, and has a relatively narrow tip (Fig. 3). The culmen is also gently down-curved as in the previous subspecies (Fig. 2).

There has been considerable misuse of the name *partiararia* Portenko, 1954, for this population. Portenko's decision to name this population was based on a belief that the type locality of *baicalensis* was Irkutsk, as given by Johansen (1952) and repeated by the Orn. Soc. Japan (1958). Johansen (op. cit.) no doubt tried to establish whether Taczanowski had given a type locality, but, although the original discussion where this name is introduced appeared in his description of *albifrons* and clearly referred to a population west of that, it was left vague and the area referred to would certainly include land both west and east of Lake Baikal. Taczanowski (1889) did not even list the type. However, Sztolcman & Domaniewski (1927) listed a "typus", which, in the absence of a qualifying comment and in accordance with Art. 74.5 of the Code (I.C.Z.N., 1999), must be construed as a lectotype. This was from Sarasun, which is near Chita in Transbaikalia. Hence *partiararia* Portenko, 1954, from Sretensk, must be considered a junior synonym of *baicalensis* Taczanowski, 1882, as the type locality flows from the designated lectotype (Art. 74.1.2). Only if it can be shown that the Sarasun specimen was not part of the type series can this be changed (Art. 74.2).

Range: the breeding grounds stretch from Lake Baikal, Central Mongolia, and south-western Yakutia to the Sea of Okhotsk and the Kolyma Range. In the south the birds inhabit the Khangai Mountains, the Kentei Range, the mountains east of Hovsgol Nuur (Koso Gol), all Transbaikalia and east to the Amur Valley. In western Yakutia (the valley of the Vilyui River) the northern border of the range lies at 63°N (Andreev, 1974); to the east it reaches north to 60°N (Vorobyev, 1963). Along the coast of the Sea of Okhotsk this subspecies is distributed approximately from the Gizhiga Gulf (Gizhigin-skaya Guba) to the central parts of the Kolyma Range (Kistchinski & Lobkov, 1979). In the Amur Valley this form grades into *S. e. amurensis*.

*Sitta europaea sakhalinensis* Buturlin, 1916

The smallest of the white-bellied forms. Upper parts bluish-gray (Medium Plumbeous) as in *asiatica*, but lighter than *baicalensis* and *amurensis*, and noticeably

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<sup>3</sup> Greenway (1967: 127) dated this 1886, but see Editorial Division (1947: 63). He also cited p. 392 where this is described, but the name *clara* first appears in a key on p. 390.

darker than in *clara*, *takatsukasai* Momiyama, 1931, and *albifrons*. The white spot on the forehead is almost as prominent as that of *asiatica*, and much more so than that of *baicalensis*, but it is noticeably less prominent than in *clara*, *takatsukasai* and *albifrons*. The bill is on average shorter than that of all other forms (from the edge of the forehead usually no more than 16 mm). The culmen is virtually straight for most of its length, so that the bill looks up-turned (Fig. 2).

Range: Sakhalin Island.

*Sitta europaea clara* Stejneger, 1887

Upper parts greyish-blue (a bit lighter than Medium Plumbeous), noticeably lighter than in *asiatica*, *baicalensis*, *sakhalinensis* and *amurensis*, and almost as light as *takatsukasai* and *albifrons*. In contrast to these two it appears more bluish, less light grey. The white spot on the forehead and above the black brows is more pronounced than in *asiatica*, *baicalensis*, *sakhalinensis*, and *amurensis*, but on average a bit less visible than in *takatsukasai* and *albifrons*. In overall size it is larger than *asiatica* and *sakhalinensis*, and on average close in size to *baicalensis* and *takatsukasai*, but smaller than *albifrons*. The bill is short but averages longer than that of *sakhalinensis*. The culmen is noticeably more curved (Fig. 2) than that of *baicalensis* and *asiatica*, and so the bill has a rather conical shape.

The name *S. e. bergmani* Momiyama, 1931, was based on specimens from Kunashir Island, but specimens from Kunashir, Shikotan and Hokkaido analyzed by us are absolutely indistinguishable.

Range: Kunashir and Shikotan (southernmost Kuriles); Hokkaido.

*Sitta europaea takatsukasai* Momiyama, 1931

This faintly coloured race has the largest bill of the entire complex. The white spots on the inner webs of the outermost rectrices are on average wider than those of all other subspecies, excluding *arctica* (Fig. 5). The colour of the upper parts is noticeably lighter than in *asiatica*, *baicalensis*, *sakhalinensis* and *amurensis*, and approximately as light as in *clara* and *albifrons*. The upper parts look more light grey and less bluish, unlike those of *clara*. They are not unlike those of *albifrons* but a bit darker. The white spot on the forehead and above the black brows is as pronounced as in *albifrons* and is noticeably larger than in all other races. All male specimens examined (n = 10) had a pure-white belly, as did 2 females.

In overall size this form resembles *baicalensis* and *clara* and is slightly smaller than *albifrons*. The bill is massive, in average width and height larger than all other subspecies. The culmen is decurved, so the bill has a conical shape analogous to that of *clara*, but it is significantly longer and wider (Fig. 2).

For a long time nobody could confirm the validity and range of this subspecies because the type (or types), in the Taka-Tsukasa collection, was almost certainly lost in World War II 1945 (Morioka et al., 2005), and collections from Iturup and Urup islands included no matching birds. As a result, for many years the name *takatsukasai* was often used for the nuthatches inhabiting all the southern Kuriles, including Kunashir and Shikotan (Nechaev & Fujimaki, 1995; Nechaev, 2005; Stepanyan, 1990, 2003) with *clara* used only for the birds of Hokkaido. We have been able to examine 12 specimens from

Iturup Island, including 1 specimen collected in the summer of 1953 (ZISP), 3 specimens collected by V. Nechaev in summer 1990 (IBSS) and 8 nuthatches collected by our (ZMMU) expedition in 2004. The morphological identity of all these and comparisons with numerous specimens from Kunashir and Shikotan allow us to confirm the distinctiveness of this population.

Range: Iturup and Urup (the southern Kuriles).

*Sitta europaea albifrons* Taczanowski, 1882

A large, very pale coloured race and with the palest upper parts which are light bluish-grey (lighter than Medium Plumbeous) and less bluish than those of *clara*. Their colour is close to that of *takatsukasai*, but the upper parts are a bit lighter, and the white pattern on the outermost pair of rectrices occupies on average a slightly smaller area, though it spreads more widely than in all other subspecies. The white pattern on the forehead and above the black brows is just as pronounced as in *takatsukasai*. Females of this subspecies, unlike those of the preceding forms, have yellowish-ochre tint on the belly less often and it is not very pronounced. No males have been recorded with this coloration.

The overall size is relatively large, among white-bellied subspecies only *arctica* is larger. The bill is long and slender, compressed noticeably in the frontal part, always with a very narrow and very straight culmen which sharply distinguishes this form from *takatsukasai* (Fig. 2).

Range: Kamchatka Peninsula, Paramushir Island (northern Kuriles), southern parts of the Koryak Highlands westwards to the lower reaches of the Penzhina River.

*Sitta (europaea) arctica* Buturlin, 1907

The general coloration of the upper parts is dark bluish-gray (plumbeous) quite similar to that of *amurensis*, and darker than all other white-bellied forms. The black stripe on the side of the head is narrower and shorter than in all other subspecies. The light colouring on the forehead and above the black stripes is less pronounced than in all other subspecies or is even completely absent. These birds never have light tips to the greater coverts, which are in common for all other white-bellied subspecies in fresh plumage. On the sides of the underparts the chestnut (Warm-Sepia) pattern occupies a larger area than in all other Asiatic subspecies, but the centre of the belly is always pure-white. One more distinction of *arctica* is the colour of the plumage of the under wing. All *Sitta europaea* subspecies have light - whitish or pale grey lower coverts to the secondaries, while *arctica* has dark - plumbeous-grey coverts. Sexual dimorphism, characteristic of all the subspecies of this group, and evident in different ventral coloration, is absent in *arctica*. Both sexes have the under tail-coverts True Cinnamon with fainter white spots on the tips. A white pattern dominates on the last two pairs of rectrices, unlike that in all forms of *Sitta europaea* (Fig. 5).

The overall size is noticeably larger than all Asiatic subspecies of *S. europaea*. Among the most distinctive features are the shapes of the wings, feet and bill. The second primary (counted from the rudimentary outer first one) is as long as or shorter than the seventh, whereas in all other *Sitta europaea* it is significantly longer than the seventh and



closer to the sixth. Despite the large size, the tarsi and toes are on average shorter than in all other nuthatches of the Asiatic group. On the other hand the claws of *arctica* are noticeably larger. The hind claw is almost as long as its toe whereas the hind toe of all other forms of *Sitta europaea* is usually 2-3 mm longer than the claw (Fig. 4). The bill on average is longer than that of the majority of Asiatic forms, but it is significantly thinner (Fig. 3). The culmen is straight not decurved (Fig. 2). It is these significant structural differences which led Buturlin (1907) to describe this bird as a separate species, and later to place it in a monotypic genus *Arctositta* (Buturlin, 1916). Dunajewski (1934) and Eck (1976, 1984) also thought it deserved species status.

There are no data about their hybridization, on the contrary Kistchinski & Lobkov (1979), pointed to its absence. Only one record is known of a "strictly intermediate" specimen from Ayan village on the Sea of Okhotsk coast (Portenko, 1937), but we have seen no such specimens in collections. There has been no research on the ecology of *arctica* in comparison to neighboring white-bellied forms, but this is obviously necessary. One can find only fragmentary information on this subject. The voice of *arctica* is said to differ sharply from that of all *Sitta europaea* subspecies (Portenko, 1939), but this needs fuller documentation. During autumn-winter migration *arctica* nuthatches occur in mixed flocks with *S. e. asiatica* (Bershitskaya, 2002), and with *S. e. baicalensis*, as shown from label data on specimens from the south-eastern parts of Yakutia, collected by B. Andreev (ZMMU).

Range: from the upper streams of the Lower Tunguska and the Lena River, eastwards to the lower Anadyr River, north-western parts of the Koryak Highlands, and the upper Penzhina River (Portenko, 1939; Kistchinski & Lobkov, 1979; Kistchinski, 1980, 1988). This form seems not to reach the Sea of Okhotsk coast. In Yakutia it is distributed to about 60°N in the Lower Lena, and in the basin of the Yana river it breeds up to 68°N (Vorobyev, 1963). During eruptive autumn migrations it reaches the Yenisei Valley (Bershitskaya, 2002). The breeding range of this form borders and even partly overlaps with the ranges of 3 subspecies of *S. europaea*. On the west side of the Yenisei basin and the valleys of the tributaries on that side it meets *asiatica*, in the south parts of Yakutia it meets *baicalensis*, and in the valley of the Penzhina River it meets *albifrons*.

#### The rufous-bellied "*roseilia* group" (5 forms)

##### *Sitta europaea amurensis* Swinhoe, 1871

A large, rufous-bellied Asiatic form. The throat and breast are white, the belly intense yellow-ochre (varies from clay-colour to yellow-ochre). The border between these two colours is not sharp but gradual. In the Sikhote-Alin Range there occur birds with very pale white bellies, sometimes almost pure white. This phenomenon is apparently not due to hybridization with white-bellied forms, it is only individual variation in the coloration of *amurensis*, and yet it is characteristic only for these regions. The upper parts are darker than in the white-bellied subspecies, on average a bit darker than in *baicalensis* and *arctica*. The white spot on the forehead and above the black brows is only faintly distinct (much as in *baicalensis*); sometimes it is almost completely absent.

The overall size is larger than other Asiatic subspecies, but smaller than *arctica*. The bill is massive, but on average a bit shorter than in *takatsukasai*, *albifrons*, and *arctica*. In bill

width and height only *takatsukasai* has greater dimensions; it noticeably exceeds the average in each of the other two subspecies. The culmen is only gently decurved (Fig. 2).

Range: distributed southwards and south-eastwards from the Middle and Lower Amur valley and in the north-eastern regions of China<sup>4</sup>. In Russia, in the Primorskii region and south parts of Khabarovsk region. Probably also the form present in most or all of continental Korea. We do not have materials from southern Korea, but the specimens from northern Korea are absolutely similar to the birds from the Russian Far East, and undoubtedly belong to *amurensis*. Nuthatches from the Korean peninsula have sometimes been included in the colourful form *bedfordi* from Cheju Do I. (Dunajewski, 1934), and sometimes in the rather pale race *hondoensis* from Honshu Is. (Voinstvenski, 1954). Further study is needed here. Northwards from the lower Amur, and in Dauria, *amurensis* intergrades with *baicalensis*.

#### *Sitta europaea hondoensis* Buturlin, 1916

This is very similar to *amurensis*, but differs by its paler coloration and is a bit smaller. The upper parts are bluish-grey (Medium Plumbeous), and the bluish tint is as dominant as in *clara*, but it is significantly darker. At the same time it is lighter, having less dark grey in its tonality, than in *amurensis*. The white on the forehead and in particular above the black brow on average occupies a greater area than in *amurensis*, but is significantly smaller than in *clara*. Birds in fresh plumage have the belly a Pale Pinkish Buff tint, which is significantly less bright than in *amurensis* (this is well shown by 6 specimens collected in autumn-winter). The border between the belly and white breast is less well marked than in the previous subspecies. In colour *hondoensis* represents a link between white-bellied nuthatches *S. e. clara* found to the north in Hokkaido and the dark, rufous-bellied *S. e. roseilia* of southern Kyushu. We suggest that the white-bellied nuthatches inhabiting the Japanese Alps, mentioned by Vaurie (1957, 1959), are *hondoensis* but showing somewhat greater individual variation. In this we agree with Morioka (1994: 170, 2000) except that we recognize *hondoensis*. We had no actual specimens from the Japanese Alps to examine, but taking into account the breeding of very pale, almost white-bellied nuthatches belonging to *amurensis* in the Sikhote-Alin Range, we suppose this is an analogous case.

The wing and tail dimensions average shorter than in *amurensis*. The bill is massive, almost as large as that of *amurensis*. The culmen is slightly decurved (Fig. 2).

Range: Honshu, Shikoku and northern Kyushu (see Morioka, 2000: 315-316).

#### *Sitta europaea roseilia* Bonaparte, 1850

A brightly coloured, rufous-bellied form. We have not examined any specimens of this subspecies, but according to literature descriptions (Vaurie 1957, 1959; Harrap,

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<sup>4</sup> Eck (1976) suggested that *S. e. kleinschmidti* Hartert & Steinbacher, 1933, is better recognized than treated as a synonym of *amurensis* (as has been the practice in recent years). We have been able to examine just one specimen of this and can offer no comment either way.

1996), it resembles *amurensis* and, correspondingly, *hondoensis*, but is darker throughout; bluer grey, more slaty above, and more rufous brownish buff below. More recently, Japanese distribution was reviewed by Morioka (1994) who said "... southern Kyushu birds are distinguishable at a glance from *amurensis* [of Honshu] in having the upperparts much darker (darker grey than *amurensis*) and the lower breast and abdomen uniformly washed with rufous brown". There are no data on the measurements.

Range: Miyazaki and Kagoshima prefectures in southern Kyushu (see Morioka, 2000: 315-316).

*Sitta europaea bedfordi* Ogilvie-Grant, 1909

A dark-coloured form, and the one with the brightest belly. According to literature descriptions (Vaurie 1957, 1959; Harrap, 1996), it is similar to *roseilia* above but the throat is whiter and the abdomen darker rufous brown, with the result that the colour pattern contrasts more than in *roseilia* and other rufous-bellied subspecies.

The dimensions judging from wing length measurements (Dunajewski, 1934; Harrap, 1996) are a bit less than in *amurensis*.

Range: the endemic of Cheju Do Island (Quelpart), situated to the south from Korean peninsula.

*Sitta europaea seorsa* Portenko, 1955

The palest of the rufous-bellied subspecies. Distinguished and described with the help of two male skins in worn (May) and fresh (August) plumage, collected in the eastern Tian Shan. Buturlin (1916) paid attention to these specimens long ago and reported that the bird collected in August "...was exceedingly like *S. e. amurensis*; perhaps only just a shade paler on the belly (creamy – ochraceous)...". Later, Portenko (1955) took into account the isolation of this locality from the general *Sitta europaea* range and named this population.

The belly colour of the male in fresh plumage corresponds to Pale Horn colour with some transition into Buff. The shade of the upper parts is Medium Plumbeous, as in *asiatica*. The white spot on the forehead and above the brow of two specimens is more extensive than in *asiatica* and *amurensis*. Judging by the dimensions of these males and by the wing length of three males from Tian Shan (Johansen, 1952), this form averages larger than *asiatica*, but is obviously smaller than *amurensis*. Bill shape and size are similar to that of *asiatica*. This subspecies is recognized tentatively; more specimens are required to confirm its validity.

Range: endemic to the coniferous forests of eastern Tian Shan (Xinjiang, China).

The rufous-breasted "*sinensis* group" (2 forms)

*Sitta europaea sinensis* Verreaux, 1870

A dark coloured rufous-breasted form. Upper parts dark bluish-dark-grey, darker than plumbeous. The forehead and the area above the black brow only a bit lighter than the crown, not white. In fresh plumage the underparts are rufous brownish, or

cinnamon, as a rule, darker than the colour of the belly of *amurensis*. The outer rectrices of *sinensis*, and *formosana*, have smaller white spots than all the remaining subspecies, and also differ by having black spots on the tips (Fig. 5).

This form has a medium-sized short bill, which resembles that of *sakhalinensis* in length, but it is significantly more massive. The culmen is quite strongly decurved (Fig. 2).

Range: continental China, north to the provinces Liaoning and Hubei, west to southern Gansu and central Sichuan, and south to northern Guangxi.

#### *Sitta europaea formosana* Buturlin, 1911

This rufous-breasted race is paler and smaller, but longer-billed than the other subspecies. The upperparts are bluish-grey (Medium Plumbeous), but much paler than *sinensis* and lighter than *amurensis*. The forehead and area above the black brow have a whitish shade that distinguishes this form from *sinensis*. The underparts are a bit lighter than those of *sinensis* and of more pure ochre-rufous tint.

The length of wing, tail and tarsus is on average less than in *sinensis*. The bill is longer and thinner and the upper mandible is noticeably compressed in the frontal part (Fig. 3), and the culmen is quite strongly decurved (Fig. 2).

Range: Taiwan.

#### Acronyms<sup>5</sup>

IBSS	Institute of Biology and Soil Sciences, Far East Branch of the Russian Academy of Sciences, Vladivostok.
MPSU	Moscow Pedagogical State University.
SDM	Moscow State Darwin Museum.
ZISP	Zoological Institute of the Russian Academy of Sciences, St. Petersburg.
ZMMU	Zoological Museum Moscow State University.

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<sup>5</sup> The acronyms used for museums in Europe in the 'Systematic notes' are almost all drawn from Roselaar (2003).

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<sup>6</sup> Sauer (1982) established that the first 27 parts had 20 plates each. There is no reason why these would not have been numbered consecutively; therefore Pt. 12 would have contained pls. 221-240. Dated 1837 by Greenway (1967).

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<sup>7</sup> Greenway (1967: 131) thought that Verreaux's article appeared in 1871 but the volume title page is dated 1870 and Verreaux (1871: 28) referred to his description as having been in 1870.

<sup>8</sup> In the English edition published in 1970 by the Israel Program for Scientific Translation the nuthatches are on pp. 851-870.

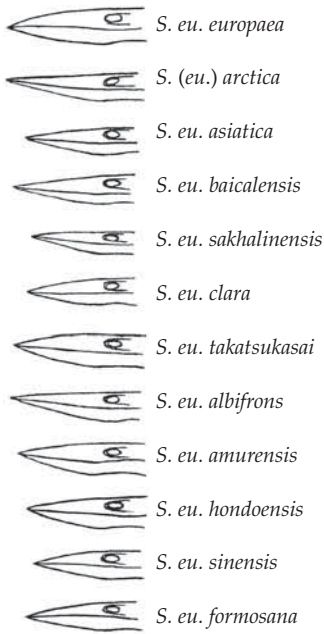


Fig. 2. Side view of bills of different *Sitta europaea* subspecies.

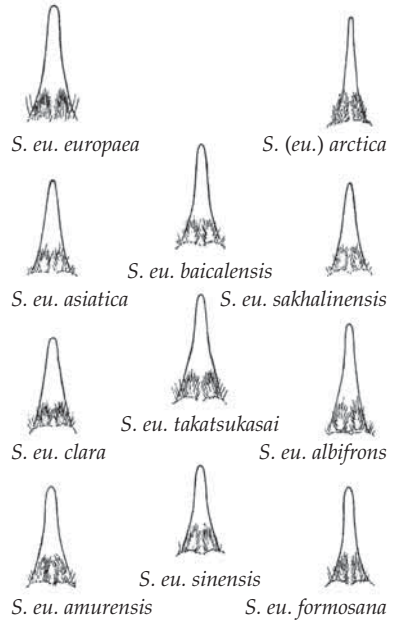


Fig. 3. Bill shape of different *Sitta europaea* subspecies (view from above).

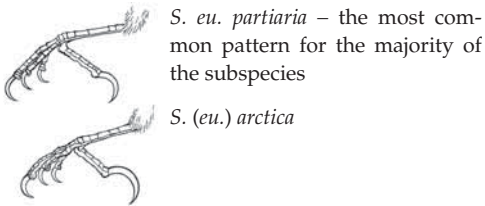


Fig. 4. Foot structure of Asiatic subspecies of *Sitta europaea* (left foot).



Fig. 5. Outer rectrix colour pattern of different *Sitta europaea* subspecies.

- 1 – *S. (eu.) arctica*
- 2 – *S. eu. takatsukasai*
- 3 – *S. eu. amurensis* (the most common pattern for the majority of the subspecies)
- 4 – *S. eu. sinensis*



Table 2. Some measurements (in mm) from skins of males of eastern Asiatic forms of *Sitta europaea sensu lato*. Mean measurements  $\pm$  standard deviation, n – number of samples, range – min-max, l = length, d = depth, w = width

Subspecies	Wing l	Tail l	Tarsus l	Bill l	Bill from nostril l	Bill d	Bill w	Hind toe l	Hind toe claw l
<i>S. (e.) arctica</i>	86.42 $\pm$ 0.15 (n=13) 83.8-90.0	49.85 $\pm$ 0.20 (n=14) 47.9-52.5	16.99 $\pm$ 0.16 (n=14) 15.6-17.8	18.61 $\pm$ 0.20 (n=13) 17.0-19.6	13.91 $\pm$ 0.20 (n=13) 12.15-14.9	4.10 $\pm$ 0.11 (n=13) 3.8-4.3	5.36 $\pm$ 0.09 (n=14) 5.1-5.6	10.65 $\pm$ 0.08 (n=14) 10.3-11.2	10.49 $\pm$ 0.20 (n=14) 9.7-12.0
<i>S. e. asiatica</i>	79.40 $\pm$ 0.19 (n=91) 76.0-82.3	41.16 $\pm$ 0.24 (n=92) 37.5-44.9	17.54 $\pm$ 0.18 (n=88) 16.1-19.25	16.31 $\pm$ 0.20 (n=91) 15.0-18.2	11.79 $\pm$ 0.19 (n=91) 9.0-13.1	4.07 $\pm$ 0.14 (n=81) 3.5-4.7	5.78 $\pm$ 0.16 (n=88) 5.1-6.5	11.55 $\pm$ 0.18 (n=97) 10.0-13.3	8.37 $\pm$ 0.29 (n=98) 6.8-9.6
<i>S. e. baicalensis</i>	82.16 $\pm$ 0.16 (n=44) 78.8-85.6	43.70 $\pm$ 0.27 (n=39) 41.3-47.8	18.21 $\pm$ 0.15 (n=45) 17.0-19.7	17.04 $\pm$ 0.17 (n=41) 15.7-18.5	12.51 $\pm$ 0.20 (n=43) 11.2-13.9	4.44 $\pm$ 0.12 (n=40) 3.9-4.9	6.03 $\pm$ 0.17 (n=40) 5.0-6.8	12.00 $\pm$ 0.17 (n=41) 10.7-13.2	9.15 $\pm$ 0.20 (n=41) 7.7-10.1
<i>S. e. sakhalinensis</i>	78.44 $\pm$ 0.19 (n=16) 75.4-81.6	41.63 $\pm$ 0.19 (n=15) 38.9-44.2	17.58 $\pm$ 0.17 (n=16) 15.7-18.4	14.85 $\pm$ 0.15 (n=15) 14.1-16.35	10.93 $\pm$ 0.19 (n=15) 9.8-12.1	3.98 $\pm$ 0.16 (n=14) 3.5-4.35	5.55 $\pm$ 0.15 (n=15) 5.0-6.35	11.76 $\pm$ 0.20 (n=15) 10.0-12.7	8.33 $\pm$ 0.15 (n=16) 7.5-9.0
<i>S. e. clara</i>	81.49 $\pm$ 0.18 (n=32) 79.0-85.0	42.83 $\pm$ 0.20 (n=32) 39.8-45.3	18.27 $\pm$ 0.16 (n=32) 17.0-19.7	15.50 $\pm$ 0.12 (n=29) 14.6-16.5	11.26 $\pm$ 0.13 (n=29) 10.6-12.6	4.28 $\pm$ 0.11 (n=28) 3.8-4.6	5.85 $\pm$ 0.15 (n=28) 5.2-6.65	12.47 $\pm$ 0.12 (n=31) 11.6-13.45	8.69 $\pm$ 0.14 (n=30) 8.0-9.5
<i>S. e. takatsukasai</i>	80.99 $\pm$ 0.20 (n=9) 77.5-83.0	44.20 $\pm$ 0.16 (n=9) 42.0-45.7	18.83 $\pm$ 0.13 (n=10) 18.1-19.8	18.79 $\pm$ 0.19 (n=7) 17.7-19.65	12.59 $\pm$ 0.16 (n=7) 12.1-13.5	4.69 $\pm$ 0.16 (n=8) 4.4-5.1	6.69 $\pm$ 0.13 (n=9) 6.2-7.3	12.53 $\pm$ 0.21 (n=10) 11.5-13.5	8.92 $\pm$ 0.16 (n=9) 8.2-9.6
<i>S. e. albifrons</i>	82.14 $\pm$ 0.19 (n=17) 79.3-86.0	44.42 $\pm$ 0.26 (n=17) 42.0-47.5	18.59 $\pm$ 0.13 (n=17) 17.2-19.6	18.39 $\pm$ 0.19 (n=13) 17.45-19.25	13.15 $\pm$ 0.15 (n=13) 12.1-14.0	4.35 $\pm$ 0.09 (n=13) 4.1-4.6	6.04 $\pm$ 0.10 (n=15) 5.7-6.4	12.32 $\pm$ 0.12 (n=17) 11.4-12.9	9.39 $\pm$ 0.13 (n=16) 8.5-9.85
<i>S. e. amurensis</i>	83.39 $\pm$ 0.17 (n=40) 80.1-88.2	44.71 $\pm$ 0.20 (n=39) 42.2-48.7	18.94 $\pm$ 0.14 (n=41) 17.0-19.9	17.36 $\pm$ 0.17 (n=40) 16.1-18.85	12.58 $\pm$ 0.20 (n=40) 11.6-14.25	4.56 $\pm$ 0.11 (n=38) 4.1-5.0	6.33 $\pm$ 0.14 (n=40) 5.3-6.9	12.54 $\pm$ 0.15 (n=39) 11.3-13.6	8.96 $\pm$ 0.16 (n=38) 8.0-10.0
<i>S. e. hondoensis</i>	81.30 $\pm$ 0.06 (n=3) 80.7-81.8	42.90 $\pm$ 0.09 (n=3) 42.5-43.6	18.97 $\pm$ 0.01 (n=3) 18.9-19.0	17.13 $\pm$ 0.17 (n=3) 16.4-17.8	12.17 $\pm$ 0.11 (n=3) 11.9-12.6	4.38 $\pm$ 0.04 (n=3) 4.3-4.45	6.43 $\pm$ 0.02 (n=3) 6.4-6.5	12.97 $\pm$ 0.02 (n=3) 12.9-13.0	8.97 $\pm$ 0.35 (n=3) 8.0-10.0
<i>S. e. seorsa</i>	81.6; 82.0 (n=2)	44.3; 44.4 (n=2)	17.7; 18.2 (n=2)	16.3; 16.7 (n=2)	11.5; 12.4 (n=2)	4.45; 4.45 (n=2)	5.65; 5.8 (n=2)	12.2; 12.35 (n=2)	8.7; 8.9 (n=2)
<i>S. e. sinensis</i>	80.87 $\pm$ 0.25 (n=7) 79.0-85.0	42.23 $\pm$ 0.23 (n=8) 39.7-43.9	18.88 $\pm$ 0.15 (n=8) 18.0-19.5	14.98 $\pm$ 0.12 (n=7) 14.5-15.6	10.54 $\pm$ 0.07 (n=7) 10.15-10.8	4.09 $\pm$ 0.14 (n=7) 3.6-4.3	6.00 $\pm$ 0.12 (n=7) 5.6-6.3	12.89 $\pm$ 0.16 (n=8) 12.2-13.7	9.00 $\pm$ 0.17 (n=8) 8.3-9.6
<i>S. e. formosana</i>	75.6; 78.6 (n=2)	37.6; 38.4 (n=2)	17.8; 18.2 (n=2)	15.2; 15.6 (n=2)	11.35; 11.4 (n=2)	3.8 (n=1)	5.25; 5.7 (n=2)	12.2; 12.6 (n=2)	8.6; 9.4 (n=2)

Table 3. Some measurements (in mm) from skins of females of eastern Asiatic forms of *Sitta europaea sensu lato*. Mean measurements  $\pm$  standard error, n – number of samples, range – min-max, l = length, d = depth, w = width

Subspecies	Wing l	Tail l	Tarsus l	Bill l	Bill from nostril l	Bill d	Bill w	Hind toe l	Hind toe claw l
<i>S. (e.) arctica</i>	83.86 $\pm$ 0.22 (n=7) 81.3-87.7	46.71 $\pm$ 0.22 (n=7) 44.8-49.0	16.91 $\pm$ 0.11 (n=7) 16.4-17.5	19.05 $\pm$ 0.13 (n=6) 18.6-20.1	14.32 $\pm$ 0.15 (n=6) 13.7-15.2	4.10 $\pm$ 0.13 (n=6) 3.7-4.4	5.39 $\pm$ 0.10 (n=7) 5.2-5.7	10.38 $\pm$ 0.14 (n=7) 9.6-10.8	10.59 $\pm$ 0.17 (n=7) 9.8-11.2
<i>S. e. asiatica</i>	77.82 $\pm$ 0.20 (n=75) 74.0-81.5	40.0 $\pm$ 0.28 (n=72) 36.2-44.0	17.28 $\pm$ 0.18 (n=72) 15.5-18.7	16.26 $\pm$ 0.23 (n=70) 14.1-18.2	11.77 $\pm$ 0.17 (n=70) 10.6-13.5	4.00 $\pm$ 0.14 (n=57) 3.5-4.5	5.68 $\pm$ 0.16 (n=67) 4.9-6.4	11.48 $\pm$ 0.18 (n=71) 9.7-13.0	8.48 $\pm$ 0.26 (n=70) 7.0-9.75
<i>S. e. baicalensis</i>	80.35 $\pm$ 0.12 (n=32) 77.6-82.4	43.69 $\pm$ 0.37 (n=27) 39.9-53.4	18.21 $\pm$ 0.09 (n=31) 17.2-18.8	16.60 $\pm$ 0.18 (n=23) 15.0-18.0	12.32 $\pm$ 0.21 (n=24) 11.0-13.6	4.24 $\pm$ 0.17 (n=24) 3.5-4.9	6.09 $\pm$ 0.13 (n=31) 5.4-6.7	12.15 $\pm$ 0.14 (n=27) 11.3-13.4	9.17 $\pm$ 0.19 (n=31) 8.2-10.5
<i>S. e. sakhalinensis</i>	75.71 $\pm$ 0.29 (n=10) 70.5-79.4	40.43 $\pm$ 0.33 (n=10) 37.0-45.0	17.60 $\pm$ 0.15 (n=11) 16.7-18.9	14.65 $\pm$ 0.12 (n=9) 14.3-15.7	10.81 $\pm$ 0.10 (n=9) 10.3-11.4	3.96 $\pm$ 0.12 (n=9) 3.6-4.2	5.57 $\pm$ 0.14 (n=11) 5.2-6.2	11.34 $\pm$ 0.36 (n=11) 9.0-12.3	8.59 $\pm$ 0.19 (n=11) 7.6-9.3
<i>S. e. clara</i>	78.71 $\pm$ 0.19 (n=13) 75.0-80.8	42.05 $\pm$ 0.30 (n=13) 39.0-44.3	18.07 $\pm$ 0.09 (n=14) 17.3-18.7	15.03 $\pm$ 0.16 (n=12) 14.1-15.8	10.94 $\pm$ 0.16 (n=12) 9.8-11.6	4.2 $\pm$ 0.11 (n=13) 3.9-4.5	5.95 $\pm$ 0.16 (n=14) 5.4-6.5	12.37 $\pm$ 0.12 (n=14) 11.7-13.0	8.45 $\pm$ 0.17 (n=14) 8.0-9.6
<i>S. e. takatsukasai</i>	79.2; 81.1 (n=2)	41.0; 45.9 (n=2)	18.35; 18.7 (n=2)	-	-	-	-	12.35; 13.3 (n=2)	8.3; 9.5 (n=2)
<i>S. e. albifrons</i>	79.98 $\pm$ 0.17 (n=13) 77.0-82.2	43.21 $\pm$ 0.22 (n=12) 41.8-45.1	18.49 $\pm$ 0.18 (n=13) 17.1-19.9	18.18 $\pm$ 0.30 (n=9) 15.9-19.9	13.07 $\pm$ 0.22 (n=9) 11.7-14.0	4.21 $\pm$ 0.15 (n=11) 3.6-4.5	5.90 $\pm$ 0.15 (n=13) 5.4-6.35	12.19 $\pm$ 0.13 (n=13) 11.6-12.8	9.1 $\pm$ 0.16 (n=13) 8.2-9.7
<i>S. e. amurensis</i>	80.85 $\pm$ 0.14 (n=26) 79.0-83.3	42.71 $\pm$ 0.18 (n=26) 40.0-45.0	18.69 $\pm$ 0.17 (n=26) 17.5-19.9	17.16 $\pm$ 0.20 (n=22) 15.85-18.6	12.61 $\pm$ 0.20 (n=23) 10.7-13.8	4.48 $\pm$ 0.11 (n=25) 4.1-4.8	6.19 $\pm$ 0.16 (n=26) 5.5-6.9	12.29 $\pm$ 0.18 (n=26) 11.1-13.5	8.89 $\pm$ 0.15 (n=26) 8.0-9.6
<i>S. e. hondoensis</i>	79.6 $\pm$ 0.20 (n=4) 77.0-81.1	41.20 $\pm$ 0.07 (n=4) 40.5-41.5	18.18 $\pm$ 0.12 (n=4) 17.5-18.7	16.05 $\pm$ 0.20 (n=4) 15.2-16.8	11.75 $\pm$ 0.25 (n=4) 10.7-12.6	4.41 $\pm$ 0.11 (n=4) 4.2-4.7	6.15 $\pm$ 0.08 (n=4) 6.0-6.4	12.70 $\pm$ 0.07 (n=4) 12.4-13.0	8.93 $\pm$ 0.12 (n=4) 8.5-9.3
<i>S. e. scorsia</i>	-	-	-	-	-	-	-	-	-
<i>S. e. sinensis</i>	73.0; 78.5 (n=2)	37.6; 40.0 (n=2)	18.5; 19.1 (n=2)	14.6 (n=1)	9.8 (n=1)	4.2; 4.2 (n=2)	5.6; 6.0 (n=2)	12.0; 12.9 (n=2)	7.4 (n=1)
<i>S. e. formosana</i>	76.9 (n=1)	38.1 (n=1)	17.8 (n=1)	15.2 (n=1)	10.9 (n=1)	-	5.7 (n=1)	12.6 (n=1)	9.0 (n=1)

Table 4. Measurements of some recently collected samples of eastern Asiatic forms of *Sitta europaea sensu lato*. Mean measurements  $\pm$  standard error; n – number in sample, range – min-max.

Subspecies	Males				Females			
	Total length, mm	Wing span, mm	Weight, g	Total length, mm	Wing span, mm	Weight, g		
<i>S. (c.) arctica</i>	147.97 $\pm$ 0.52 (n=3)	256.67 $\pm$ 0.13 (n=3)	21.21 $\pm$ 0.47 (n=7)	150.67 $\pm$ 0.48 (n=3)	251.67 $\pm$ 0.18 (n=3)	19.7, 221.0 (n=2)		
<i>S. e. asiatica</i>	140.9-153.0	255.0-259.0	17.2-23.5	144.0-155.0	250.0; 250.0	17.53 $\pm$ 0.38 (n=9)		
	137.31 $\pm$ 0.47 (n=29)	245.0 $\pm$ 0.32 (n=7)	18.37 $\pm$ 0.35 (n=20)	136.55 $\pm$ 0.39 (n=11)	242.60 $\pm$ 0.29 (n=5)	14.5-19.6 (n=9)		
<i>S. e. baicalensis</i>	123.0-146.0	240.0-250.0	15.7-20.8	132.0-145.0	238.0-248.0	18.48 $\pm$ 0.37 (n=9)		
	137.88 $\pm$ 0.56 (n=13)	246.5 $\pm$ 0.30 (n=10)	18.69 $\pm$ 0.20 (n=18)	140.14 $\pm$ 0.56 (n=7)	242.80 $\pm$ 0.31 (n=5)	16.0-21.0 (n=5)		
<i>S. e. sakhalinensis</i>	129.0-152.0	240.0-253.0	17.5-20.7	132.0-150.0	236.0-248.0	15.72 $\pm$ 0.81 (n=5)		
	138.80 $\pm$ 0.33 (n=5)	241.8 $\pm$ 0.42 (n=5)	16.79 $\pm$ 0.29 (n=8)	128.67 $\pm$ 0.77 (n=3)	229.00 $\pm$ 0.86 (n=3)	10.3-18.0 (n=11)		
<i>S. e. clara</i>	134.0-144.0	234.0-252.0	15.5-19.0	119.0-136.0	214.0-237.0	18.63 $\pm$ 0.38 (n=11)		
	-	-	19.51 $\pm$ 0.29 (n=11)	-	-	16.5-21.5 (n=1)		
<i>S. e. takatsukasai</i>	144.33 $\pm$ 0.29 (n=6)	250.17 $\pm$ 0.20 (n=6)	19.49 $\pm$ 0.18 (n=9)	-	244.0 (n=1)	18.8 (n=1)		
	141.0-150.0	245.0-254.0	18.5-20.7					
<i>S. e. albifrons</i>	144.0; 145.0 (n=2)	257.0 (n=1)	19.70 $\pm$ 0.26 (n=11)	140.00 $\pm$ 0.35 (n=5)	-	18.60 $\pm$ 0.42 (n=10)		
			18.2-21.4	134.0-144.0		16.46-22.06 (n=16)		
<i>S. e. amurensis</i>	144.55 $\pm$ 0.43 (n=20)	253.0 $\pm$ 0.45 (n=14)	20.32 $\pm$ 0.26 (n=23)	144.10 $\pm$ 0.29 (n=10)	245.11 $\pm$ 0.40 (n=9)	19.25 $\pm$ 0.47 (n=16)		
	135.0-153.0	240.0-251.0	18.2-23.2	138.0-148.0	232.0-250.0	15.8-21.9		
<i>S. e. sinensis</i>	126.0; 135.0 (n=2)	235.0 (n=1)	-	125.0 (n=1)	-	-		



Plate V. Left hand column: top *S. eu. asiatica* ad. male; middle *S. eu. asiatica* ad. female (white-bellied form); bottom *S. eu. baicalensis* ad. male; right hand column: top *S. (eu.) arctica* adult, middle *S. eu. asiatica* ad. female (yellow-bellied form), bottom *S. eu. sakhalinensis* ad. male. Original by E.A. Koblik.



Plate VI. Left hand column: top *S. eu. takatsukasai* ad. male, upper middle *S. eu. amurensis* ad. male, lower middle *S. eu. seorsa* ad. male, bottom *S. eu. sinensis* ad. male; right hand column: top *S. eu. albifrons*, upper middle *S. eu. clara*, ad. male, lower middle *S. eu. hondoensis* ad. male, bottom *S. eu. formosana* ad. male. Original by E.A. Koblik.