

A reappraisal of the taxonomy of the Spotted Bush-Warbler *Bradypterus thoracicus*

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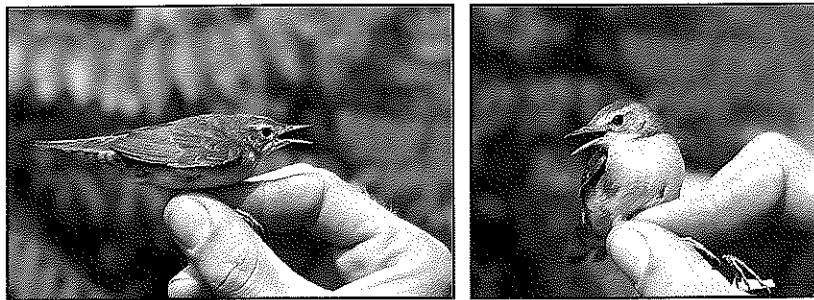
Evidence is presented to suggest that the taxon *Bradypterus thoracicus shanensis*, which is known only in winter from north-east India, Burma and Thailand, is synonymous with the northern form, *B. t. suschkini*. Morphological evidence indicates that *B. t. suschkini* and *B. t. davidi* may constitute a separate, highly migratory species, *B. davidi*. *B. thoracicus (sensu stricto)* is a shorter-distance migrant which breeds around the southern and eastern flanks of the Tibetan plateau.

INTRODUCTION

The Spotted Bush-Warbler *Bradypterus thoracicus* is one of the more widespread and frequently encountered of the Asian *Bradypterus*. In this paper, the taxonomy of *Bradypterus thoracicus* is re-examined with particular reference to the little-known taxon *B. t. shanensis*. Primaries are numbered descendently (i.e. from mid-wing outwards) and wing measurements taken by the maximum chord method. BM is the Natural History Museum, Tring, U.K.; MCZ is Museum of Comparative Zoology, Harvard, Massachusetts; USNM is National Museum of Natural History, Washington, D.C., ZIAS is Zoological Institute, Academy of Sciences, St Petersburg.

Bradypterus thoracicus has an apparently disjunct distribution: the races *kashmirensis*, *thoracicus* and *przevalskii* are distributed along the Himalayas and around the north-eastern margins of the Tibetan Plateau to north-central China. Two other races are known from northern Asia: *suschkini* occurs from the northern Altai eastwards to north-eastern Baikal while *davidi* is found from south-eastern Transbaikalia to Amurland and Manchuria (Watson *et al.* 1986). *Davidi* is also listed as breeding in Hebei province, northern China (Cheng 1987; Figure 1) and probably also breeds in adjacent Shanxi province where a few singing males were heard by Mikael Käll in June 1991 and by Per Alström in June 1993. Several singing males have also been observed in central and north-western Sichuan during 1989-1994 by P. Alström and U. Olsson (Per Alström, *in litt.*), constituting a major extension of the known range.

The seasonal distribution of these forms is not well understood. In the Himalayas, the nominate race is said to breed between 2,400 m and 3,600 m (Ali and Ripley 1987) though Inskipp and Inskipp (1991) mention a nest with eggs as high as 4,850 m. It breeds in scrub and herbage near the treeline and is an altitudinal migrant, wintering down to the plains. It inhabits low



Photos 1 and 2. *B. t. shanensis* trapped at Bung Boraphet, Nakhon Sawan province, 12 February 1981. (Specimen no. DSM 509; photo: Philip Round).

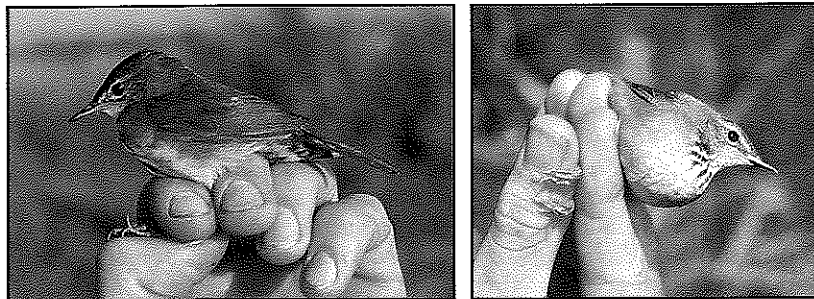


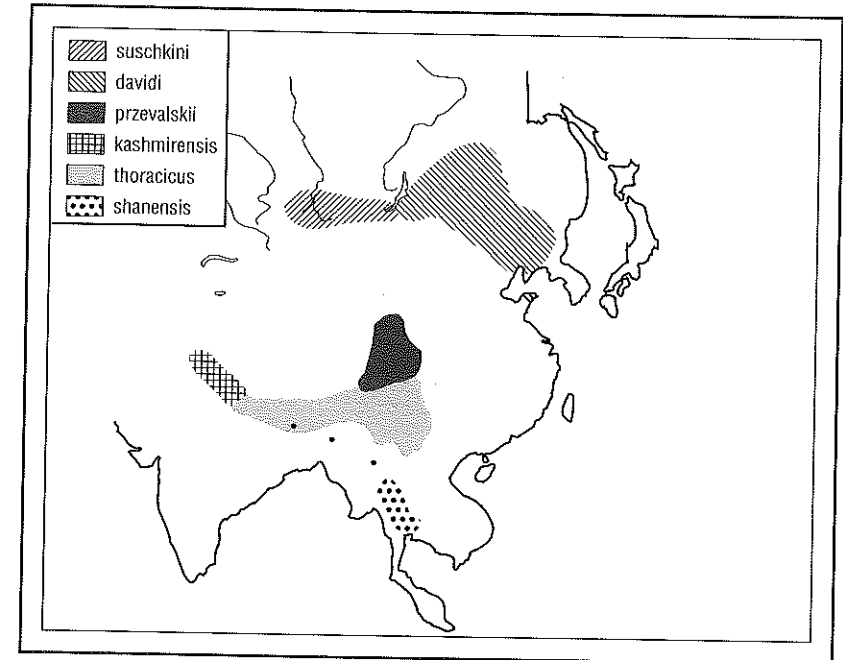
Photo 3. *B. t. shanensis* trapped at Bung Boraphet, Nakhon Sawan province, 14 February 1981. (Specimen no. DSM 525; photo: Philip Round).

Photo 4. *B. t. davidi* trapped at Beidaihe, Hebei province, 19 May 1991. Adult male, sexed on song (photo Peter Kennerley). Note that the rufous tones have been exaggerated during the reproduction of this slide.

scrub, rank grass and tangled herbage fringing the forest as well as irrigated crops (Ali and Ripley 1983). In Nepal, it winters in waterside vegetation and in reedbeds and elephant grass along rivers (Inskipp and Inskipp 1991; C. Robson pers. comm.). Cheng (1987) shows *B. t. przewalskii* as occurring from Qinghai to Gansu and northern Sichuan and *B. t. thoracicus* from Xizang Autonomous Region (Tibet) to Sichuan, Yunnan, Guizhou and Guangxi Zhuang Autonomous Region but does not indicate any separate breeding and winter ranges.

The northern forms, *suschkini* and *davidi*, inhabit moist taiga, forest glades and open grassy areas with scattered bushes (Dement'yev and Gladkov 1968). *Davidi* is also found in damp areas on scrubby hillsides in northern China (La Touche 1925-1934). Both are summer visitors, though in neither is the winter range known. Dement'yev and Gladkov (1968) state that *suschkini* winters in China, and *davidi* in southern China, although this is not corroborated by Cheng (1987). Birds are said to return to their breeding grounds in southern Transbaikalia and the Altai during the second

Figure 1. Map to show approximate known ranges of taxa under consideration.



half of June (Dement'yev and Gladkov 1968). Away from its breeding grounds, *davidi* is only known from specimens collected on migration: in Shandong province (Cheng 1987) and in Hebei province, where a few individuals have recently been observed and netted in both spring and autumn (M. Williams *in litt.*) It appears to be a late spring migrant there, passing through chiefly in late May (P. Alström *in litt.*).

THE STATUS OF *B. t. shanensis*

One further race, *B. t. shanensis*, was first described from a specimen collected on 20 October 1937 at Maymyo (3,500 ft), Myanmar (Ticehurst 1941). It is also known from Assam, India and Thailand (Watson *et al.* 1986). Unlike the previously mentioned forms, *shanensis* is only known outside the breeding season: the breeding range is said to be 'possibly in the mountains of northern Burma' (Watson *et al.* 1986).

The majority of records come from Thailand, where, since 1981, it has been recognised as a common and widespread winter visitor, from the far north of the country south to at least as far as Rangsit, Pathum Thani province (14 00'N latitude), a marshy area on the northern outskirts of

Table 1. List of specimens of *Bradypterus thoracicus shanensis* known from Thailand

1. Doi Langka, Chiang Mai province. 2 May 1931. H. M. Smith. U.S. National Museum (USNM 330868).
2. Doi Suthep, 3,300 ft, Chiang Mai province. 23 March 1937. H. G. Deignan. U.S. National Museum (USNM 344432).
3. Nong Tum, Chiang Mai province. Plains, ca. 400 m. 21 December 1965 (two specimens). B. King. U.S. National Museum (USNM 535426, 535427).
4. Bung Boraphet, Nakhon Sawan province. Plains, ca. 30 m. 12 and 14 February 1981 (two specimens). P. D. Round. Thai National Reference Collection, Bangkok (Field Nos. DSM 509, DSM 525).
5. Ban Tha Ton, Chiang Mai province. Plains, ca. 400 m. 26 February 1982. P. D. Round. Thai National Reference Collection (Field No. ACW 35).

Table 2. Summary of biometrics and wing formula of taxa studied

	wing length	length of 10th primary	position of tip of 9th primary	shortfall of 8th primary from wingpoint
<i>thoracicus</i>	55.1 ± 2.6 ** (51.0 - 59.5) n = 14	9.5 ± 1.5 ** (7.0 - 11.5) n = 14	5.0 - 9.0 (ss - p3) n = 10	1.1 ± 0.6 (0.5 - 2.0) n = 7
<i>kashmirensis</i>	55.9 ± 1.1 ** (54.0 - 57.0) n = 5	9.9 ± 0.9 ** (8.5 - 11.0) n = 5	7.5 - 9.0 (ss - p3) n = 5	0.7 ± 0.6 (0 - 1.0) n = 3
<i>przevalskii</i>	56.3 ± 1.3 ** (54.6 - 58.0) n = 11	8.0 ± 0.7 ** (7.0 - 9.1) n = 11	7.2 - 9.5 (p1 - p3) n = 11	1.0 ± 0.5 (0 - 1.7) n = 11
<i>davidi</i>	52.9 ± 2.1 NS (51.0 - 56.7) n = 8	6.0 ± 0.8 NS (5.4 - 8.0) n = 8	6.6 - 7.4 (p3 - p4) n = 5	0.3 ± 0.3 (0 - 0.7) n = 6
<i>suschkini</i>	52.5 ± 1.9 NS (50.3 - 54.9) n = 6	5.3 ± 1.3 NS (3.8 - 7.2) n = 6	5.3 - 7.4 (p3 - p5) n = 5	0.3 ± 0.3 (0 - 0.8) n = 5
<i>shanensis</i>	51.4 ± 1.2 (50.0 - 53.0) n = 8	5.9 ± 1.4 (4.0 - 8.0) n = 7	5.0 - 8.0 (p2 - p5) n = 6	0.2 ± 0.3 (0 - 0.5) n = 5
NS = difference from <i>shanensis</i> not significant; ** = difference from <i>shanensis</i> highly significant ($P < 0.01$), two-sample <i>t</i> -test				

Bangkok (Boonsong and Round 1991). It frequents scrub and grassland in open country, though almost always favours moist areas, such as along the margins of ponds, streams and canals. Though most abundant in the plains, it has been recorded up to at least 1,300 m and the fact that, until recently, it has been overlooked is due to its extremely skulking habits.

All known specimen records of *shanensis* from Thailand are listed in Table 1.

One further specimen, (BM1949-WH1-1-13132), collected from the Bengal Duars, northern West Bengal, India on 13 November 1925 by H. Whistler, and examined by P. D. R., can also be assigned to this form, extending its wintering range slightly further west (Figure 1).

Shanensis is distinguished from nominate *thoracicus* by its whiter breast, lacking any greyish suffusion, whitish supercilium, fine brownish breast-spotting and dull olive-brown upperparts lacking any strong rufescent tinge.

Ticehurst (1941) even described the upperparts as olive-grey in *shanensis* compared with russet-brown in *thoracicus*, overstating the difference slightly. All the *shanensis* specimens, and all those seen in the field by PDR showed a mainly or entirely pale, flesh-coloured lower mandible.

Although Deignan (1963) lists nominate *thoracicus* for Thailand on the basis of a single specimen collected in the mountains of Chiang Mai province, this appears to be based on an erroneous identification of specimen M.C.Z. 196866, placed by Delacour (1952) with *Bradypterus seebohmi*; this apparently remained uncorrected in Deignan (1963).

MORPHOLOGY

The Spotted Bush-Warbler is distinguished from its Asian congeners by the combination of dark brown-centred, sharply and broadly white-tipped undertail-coverts, and by its relatively short tail. The tail:wing ratio of *thoracicus* (*sensu lato*) is roughly 0.8-0.9, so that in general proportions it somewhat resembles Lanceolated Warbler *Locustella lanceolata*. Chinese Bush-Warbler *Bradypterus tacsanowskii*, Brown Bush-Warbler *B. luteoventris* and Russet Bush-Warbler *B. seebohmi* are markedly longer-tailed. In *B. seebohmi*, for example, the tail:wing ratio is ca. 1.1-1.2 (Round 1992).

Many of the differences among the various forms of *Bradypterus thoracicus* have been well described (*e.g.*, Sushkin 1925, Stegmann 1929). These races fall into two morphologically distinguishable groups.

1. The 'thoracicus group', comprising the races *thoracicus*, *kashmirensis* and *przevalskii*.

The members of this group are relatively large: the wing lengths of specimens measured ranged from 51.0-59.5 mm (mean 55.1, $n = 14$) in *thoracicus*; 54.0-57.0 (mean 55.9, $n = 5$) in *kashmirensis* and 54.6-58.0 (mean 56.3, $n = 11$) in *przevalskii* (Table 2). The wing is, however, rather strongly rounded, most obviously so in the nominate race in which the tip of the 9th (second outermost) primary usually falls opposite the tips of the secondaries or innermost first or second primaries (only exceptionally the third innermost primary). The 8th primary shows a substantial shortfall from the wingtip (0.5-2.0 mm shorter; average 1.1 mm shorter). The outermost primary is long, 7.0-11.5 mm (average 9.5 mm) longer than the longest primary covert (Table 2), or roughly half the length of the 9th primary. The races *kashmirensis* and *przevalskii* which are distributed to the west and east respectively of the nominate race, and which extend somewhat further north, show slightly less rounded wings. This is more obvious in *przevalskii*, which has a slightly shorter outermost primary (average 8.0 mm longer than longest primary covert) and a slightly longer 9th primary, with the tip usually falling opposite the tip of the third primary. This minor distinction is mentioned in Vaurie (1959).

All three forms can usually be discerned from the members of the succeeding group on plumage. In all three, the upperparts are generally warm, dark rufous-brown, (though slightly less so in *kashmirensis* and *przevalskii* than in *thoracicus*); the supercilium is greyish (though often whitish in front of, or above, the eye; P. Alström, *in litt.*); the sides of the throat and the breast, especially in the centre of the breast below the lower margin of the spotted gorget, is also strongly washed greyish. The throat and breast spotting is normally bold and the spots are blackish. The ear-coverts and sides of the neck are usually grey, though slightly lighter grey in *przevalskii* than in *thoracicus* (Sushkin 1925).

2. The "davidi group", comprising the races *davidi* and *suschkini*

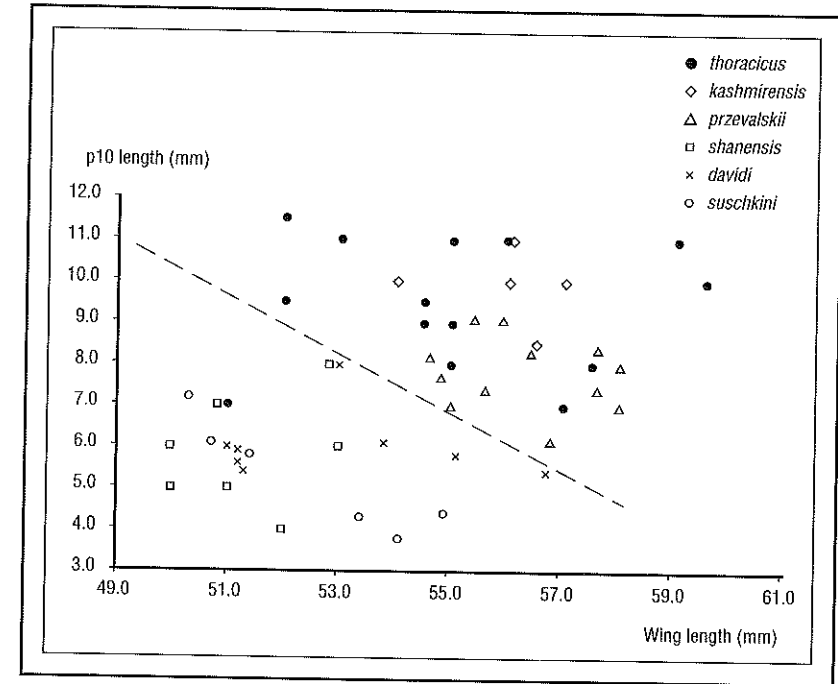
These two forms differ substantially from the *thoracicus* group of races on both biometrics and plumage. They are markedly smaller, having an average wing length of 52.9 mm (range 51.0-56.7 mm, $n = 8$) in *davidi* and 52.5 mm (range 50.3-54.9 mm, $n = 6$) in *suschkini* (Table 2). In addition, both have a slightly more pointed wing: the tip of the 9th primary falls opposite the tips of primaries 3-5 while the 8th primary is subequal to the wingpoint, ranging from 0 mm to 0.8 mm shorter. The outermost primary is much shorter, only 5.4-8.0 mm longer than the primary coverts (average 6.0 mm) in *davidi* and 3.8-7.2 mm (average 5.3 mm in *suschkini*; Table 2).

Both *davidi* and *suschkini* have less rufescent-tinged upperparts than the members of the *thoracicus* group and are somewhat colder, more olive-brown above. Both show a mainly buffy or sometimes whitish supercilium and brownish ear-coverts and sides of neck. While the differences between the two are very slight, *suschkini* is slightly paler and more pure brown and warmer-toned on the upperparts than *davidi*, has a whiter and bolder supercilium, and the spots on the throat and upper breast are browner and less clearly marked. There is considerable variation in the strength of the spotting in both forms, though. The type specimen of *davidi* at MCZ showed slightly blacker, bolder spotting than the paratype while among specimens of both *davidi* and *suschkini* in ZIAS, the spots were generally browner and sparser among juveniles and females.

Davidi may show a very slight greyish tinge on the ear-coverts and throat or breast (which is always lacking in *suschkini*) but this is always much less marked than in the *thoracicus* group.

Both *davidi* and *suschkini* are additionally distinguished from the *thoracicus* group in always showing a brownish (rather than greyish) wash across the breast below the lower margin of the gorget. On the basis of extensive experience of *thoracicus* and *davidi*, both in the field and in the hand, P. Alström (*in litt.*) has commented that the *thoracicus* group is characterised by grey supercilium, ear-coverts, sides of neck and centre of breast and, (in *thoracicus*, but not *przevalskii*) by sometimes showing a forecrown which is slightly more rufous than the rest of the upperparts. In *davidi*, the ear-

Figure 2. Scatter plot of wing length and length of outermost primary for taxa under consideration.



coverts, sides of neck and centre of breast are brown (sometimes faintly grey-tinged), the supercilium is buffy-tinged and there is no contrast between the forecrown and the rest of the upperparts.

THE POSITION OF *B. t. shanensis*

On the basis of both its measurements and its plumage features, *shanensis* closely resembles the northern forms, *davidi* and *suschkini*. The wing length of *shanensis* (average 51.4 mm; range 50.0-53.0 mm, $n = 8$) was not significantly different from either *davidi* or *suschkini* ($P > 0.1$ and $P > 0.2$ respectively; two-sample *t*-test). The length of the outermost primary in *shanensis* (average 5.9 mm longer than the primary coverts; range 4.0-8.0, $n = 7$; Table 2) also differed from neither of the other two forms ($P > 0.7$ and $P > 0.4$). By contrast, *shanensis* differed very significantly in both measurements from each of the members of the *thoracicus* group ($P < 0.01$; two-sample *t*-test). A bivariate scatter plot shows an almost complete separation between *davidi*, *suschkini* and *shanensis* on the one hand, and the members of the *thoracicus* group on the other (Figure 2).

On other features of wing formula, namely position of the tip of 9th primary, and shortfall of 8th primary from the wingpoint, *shanensis* likewise resembled *davidi* and *suschkini*.

The plumage features of *shanensis* also showed a close correspondence with those of *davidi* and *suschkini* in being colder, more olive-brown on the upperparts (instead of dark rufescent-brown as in *thoracicus*); in having a whitish supercilium and brown ear-coverts. *Shanensis* typically shows rather weak spotting on the throat and upper breast. Of a total of eight *shanensis* examined, either as actual specimens or as photographs of specimens, two bore only very slight traces of spotting while the remainder were all more or less distinctly spotted, though the spotting was weaker and browner than in *davidi*. The weaker throat spotting of *shanensis* was closely similar to one of six *suschkini* specimens held at the Academy of Sciences, St. Petersburg.

All of the features which serve to distinguish *davidi* from nominate *thoracicus*, mentioned by La Touche (1923, 1925-34) and Vaurie (1959), apply equally to *shanensis*: namely, the short outermost primary (less than half the length of the second outermost); the whitish supercilium and the generally whitish underparts with a brownish, rather than grey wash on the breast.

A direct comparison of one of the Thai *shanensis* specimens with a series of both *davidi* and *suschkini* at ZIAS showed that *shanensis* more closely resembled *suschkini* rather than *davidi* in respect of the weaker breast spotting, and on the basis of its greater development of rufous, ochre shades on both upperparts and underparts, especially on the sides of the neck, flanks and undertail-coverts.

MANDIBLE COLOURATION

The most consistent difference between *shanensis* on the one hand, and *davidi* and *suschkini* on the other, was in the colouration of the lower mandible. *Shanensis* shows a mainly or entirely pale, flesh-coloured lower mandible, whereas both the type and paratype of *davidi*, as well three out of five adult *davidi* and four out of five adult *suschkini*, including the type, at the Academy of Sciences, St. Petersburg showed dark lower mandibles. Such a difference, however, can evidently be accounted for by seasonal variation in bare part colour. The type and paratype of *davidi* were collected on 1 June and 31 May respectively (La Touche 1923) and the type of *suschkini* on 5 July (Stegmann 1929) whereas all specimens of *shanensis* were collected during the period October to early May. Moreover, a juvenile *davidi* collected by La Touche in September showed a mandible which was 'flesh-coloured, shading to yellow at its base and with dark point' (La Touche 1925-34). Of the specimens at ZIAS, two *davidi*, collected on 18 July and 4 August, and one *suschkini*, collected on 4 August, exhibited a pale basal part of the mandible with only the tip dark. A juvenile *suschkini* and

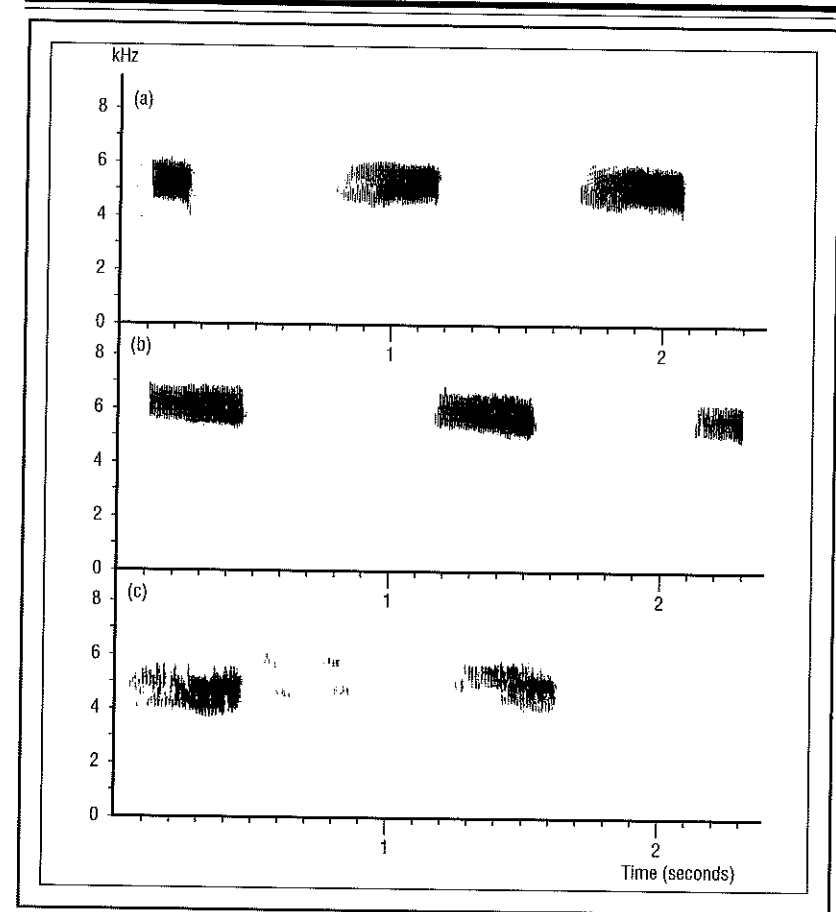


Figure 3. Sonagrams of songs of three of the taxa under consideration:

(a) *B. t. davidi*, Huzong, Greater Xingan Mountains, Heilongjiang, Peoples Republic of China, June 1988 (Per Alström). (b) *B. t. suschkini*, Listvijanka, Lake Baikal, Russia, June 1986 (Per Alström). (c) *B. t. shanensis*, Huai Kha Khaeng Wildlife Sanctuary, Uthai Thani province, western Thailand, 15 January 1983 (P. D. Round)

a juvenile *davidi*, collected on 17 August and 22 September respectively, each showed an entirely pale mandible.

Seasonal variation in the colour of the lower mandible may be typical among *Bradypterus* (with the exception of Brown Bush-Warbler *B. luteoventris*, which shows an entirely pale lower mandible throughout the year; Round 1992). Although most specimens of nominate *thoracicus* in BMNH showed a blackish lower mandible, this again seems to be a reflection of the fact that they were collected during the spring and summer. Some specimens, most of which were juveniles, showed a pale lower mandible.

VOCALIZATIONS

Supporting evidence linking *shanensis* with the northern forms, *suschkini* and *davidi*, comes from vocalizations. Both northern forms sing with a monotonous, buzzing series of notes described as 'dzzzzzzr, dzzzzzzr...' for *suschkini* (Mild 1987, Figure 3). *Davidi* sounds virtually identical (Figure 3). The song lies in the frequency range 4.5-6.5 khz, with an interval of roughly 0.5-0.7 seconds between notes. Each 'dzzzzzzr' note is about 0.4 seconds in duration and usually repeated 5-20 times in each song sequence. Different sequences follow on rapidly from each other, usually with a pause of no more than one second separating them.

Shanensis observed in Thailand in winter, often gave an almost identical 'dzzzzzzr' vocalization (described as 'dzeenk' in Boonsong and Round 1991; Figure 3), save that the interval between the notes was longer, usually 8-15 seconds and fewer notes, usually only three to five, were given per sequence. A lower intensity form of song would be consistent with birds in winter quarters.

By contrast, birds heard and tape-recorded in central China by both C. Robson and P. Alström, and said to comprise examples of both nominate *thoracicus* and *przevalskii* (P. Alström *in litt.*) sang with a quite different and diagnostic song described as a rhythmic 'trick-i-di, trick-i-di' (C. Robson) or usually 'tri-tri-tri-tree', and sometimes 'tri-tri-tree' (P. Alström). Unfortunately, there appear to be no recordings of undoubted nominate *thoracicus* from the Himalayas for comparison.

DISCUSSION

The various forms of *Bradypterus thoracicus* (*sensu lato*) fall into two distinct 'subspecies groups'.

1. The rounded-winged, *thoracicus* group of races, including nominate *thoracicus*, *kashmirensis* and *przevalskii*, which have a mainly Sino-Himalayan distribution. These forms are shorter-distance and altitudinal migrants, which presumably explains their more rounded wing. The tendency to a slightly less rounded wing in both *kashmirensis* and *przevalskii*, evident in a slightly longer eighth primary and a slightly shorter outermost primary, may perhaps be explained by their more westerly and northerly distributions, respectively, necessitating a slightly longer migration than *thoracicus*, which occupies the central, most southern portion of the range of the group. The limits of the ranges of *thoracicus* and *przevalskii* appear to be imperfectly defined, since the ranges given in Cheng (1987) and Watson *et al.* (1986) imply possible sympatry in Sichuan and northern Yunnan, which could not normally be countenanced for two subspecies. If, as seems very likely, the variation among the members of the *thoracicus* group is clinal, there should

be a zone of intergradation between nominate *thoracicus* and *przevalskii* in central China within which it might not be easy to assign individual specimens to one form or the other.

2. The races *davidi*, *suschkini* and *shanensis*, which are characterised by their smaller size and more pointed wing than the members of the preceding group. On first examination, the position of *shanensis* appears anomalous since on the basis of both biometrics and plumage it clearly belongs with *suschkini* and *davidi* rather than with *thoracicus*, yet its breeding grounds are said to be 'possibly in the mountains of northern Burma' (Watson *et al.* 1986), i.e. somewhere within the breeding range of nominate *thoracicus*.

Since *shanensis* is only known in winter, all records coming from the period October to May, whereas *davidi* and *suschkini* are known only on, or in the vicinity of, their breeding grounds across Transbaikalia and northern China, most or all records coming from the period May to August, the conclusion that *shanensis* is synonymous with either or both forms is compelling. Supporting evidence comes from the very abundance of *shanensis*, which is a common winter visitor throughout most of continental Thailand (Boonsong and Round 1991). Such abundance might be expected of a form with an extensive breeding range across northern Asia, but would be less likely of a form supposedly with a relatively restricted Sino-Himalayan or north Burmese breeding range.

Shanensis, therefore, is merely a synonym of *suschkini* which it more closely resembles on plumage than *davidi*. It can probably be assumed that *davidi* (*sensu stricto*), the more easterly-breeding form, winters further to the east, probably in Indochina. Yet it is surprising that *davidi* has not yet been recorded on passage away from north-east China, particularly Hong Kong. The fact that '*shanensis*' shows generally weaker throat and breast spotting than *suschkini* would suggest that there may be seasonal variation in this character, in which case winter *davidi*, showing weaker spotting than breeding birds, might be overlooked among *suschkini/shanensis*. It would be desirable to obtain further specimens from Thailand in order to fully examine the range of variation, as well as to search for wintering birds in Indochina.

The degree of separation between these two groups on biometrics alone strongly suggests that *Bradypterus thoracicus* (*sensu lato*), could be a composite of two distinct species, one of which comprises the Sino-Himalayan forms, (nominate *thoracicus*, *kashmirensis* and *przevalskii*) while the other comprises the northern, highly migratory forms, *davidi* and *suschkini*, and includes *shanensis* which is synonymous with *suschkini*. Any formal assignation of species limits should, however, await evidence from studies on behaviour and vocalisations, preferably involving playback experiments. If this hypothesis were proven, *suschkini* and *davidi* should be united as *Bradypterus davidi*, since *davidi* (La Touche 1923) is the senior name.

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We thank Per Alström and Craig Robson for providing much useful discussion based on their observations in western China. Craig Robson also independently examined and photographed the *shanensis* specimens in the Smithsonian Institution on our behalf while Peter Colston kindly checked the numbers of some specimens in the BM. Peter Kennerley kindly permitted us to use his photograph of *davidi* from north-east China, and he, Per Alström, Warren Brockelman and Craig Robson all commented on drafts of this manuscript. Dr Sangvorn Kitthawee gave statistical advice.

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APPENDIX

Biometrics and wing formula for all specimens examined

taxon, sex and specimen no.	wing	outer-most primary (p10)	p9	p8	p7
<i>thoracicus</i>					
m BM1938.12.13.72	59.0	+ 11.0	- 8.0 (ss)	n.r.	WP
m BM1937.1.17.609	57.5	+ 8.0	- 9.0 (p1)	- 2.0	WP
m BM1938.12.13.71	57.0	+ 7.0	- 9.0 (p1/ss)	- 1.0	WP
m BM1948.27.347	56.0	+ 11.0	n.r.	- 0.5	WP
m (BM field no.3986)	55.0	+ 9.0	- 7.0 (ss)	- 1.0	WP
m BM1935.4.5.182	55.0	+ 11.0	- 9.0 (ss)	- 1.5	WP
m (BM no. n.r.)	52.0	+ 9.5	n.r.	n.r.	n.r.
f BM1922.12.31.118	59.5	+ 10.0	- 8.5 (p2)	- 1.5	WP
f (BM field no.2076)	55.0	+ 8.0	n.r.	n.r.	n.r.
f BM1935.4.5.183	53.0	+ 11.0	- 7.5 (p2/3)	n.r.	n.r.
f (BM no.n.r.)	52.0	+ 11.5	- 5.0 (p2/ss)	n.r.	n.r.
u BM86.7.8.1872	54.5	+ 9.0	- 7.0 (p2)	- 0.5	WP
u (BM no. n.r.)	54.5	+ 9.5	n.r.	n.r.	n.r.
u (BM no. n.r.)	51.0	+ 7.0	- 8.0 (ss)	n.r.	n.r.
<i>kashmirensis</i>					
m BM1949.WH1.1.13133	56.0	+ 11.0	- 9.0 (p1/ss)	n.r.	WP
BM88.2.20.335	57.0	+ 10.0	- 9.0 (p2)	n.r.	WP (=p6)
BM1949.WH1.1.13134	56.5	+ 8.5	- 8.0 (p1/2)	- 1.0	WP
BM76.2.12.225	56.0	+ 10.0	- 7.5 (p2)	(=p7)	WP
BM86.7.8.1855	54.0	+ 10.0	- 9.0 (p3)	- 1.0	WP
<i>przewalskii</i>					
m (type) ZIAS 100512	55.9	+ 9.1	- 8.5 (p3)	- 0.9	WP
m BM98.9.1.1421	58.0	+ 8.0	- 8.5 (p3)	- 0.5	WP
m BM98.9.1.1422	58.0	+ 7.0	- 9.5 (p3)	- 1.5	WP
m ZIAS 100523/159-97	57.6	+ 8.4	- 7.6 (p3)	(=p7)	WP
m ZIAS 100507/159-97	55.6	+ 7.4	- 8.4 (p3)	- 0.9	WP
m BM98.9.1.1423	55.0	+ 7.0	- 8.5 (p3)	- 1.0	WP
m ZIAS 100525/159-97	54.6	+ 8.2	- 7.2 (p3)	- 0.3	WP
f ZIAS 100511	57.6	+ 7.4	- 7.2 (p3)	- 1.7	WP
f ZIAS 100522/159-97	56.4	+ 8.3	- 9.2 (p1)	- 1.2	WP
f ZIAS 100524/159-97	55.4	+ 9.1	- 7.8 (p3)	- 1.0	WP
f ZIAS 100515-	54.8	+ 7.7	- 7.3 (p3)	- 1.6	WP

taxon, sex and specimen no.	wing	outer-most primary (p10)	p9	p8	p7
<i>shanensis</i>					
m (type)BM	53.0	+ 6.0	broken	- 0.5	WP
m USNM 535427	52.8	+ 8.0	- 7.0	n.r.	n.r.
m DSM 525	51.0	+ 5.0	- 8.0 (p2)	WP	WP
m USNM 330868	51.5	broken/not grown	n.r.	n.r.	n.r.
m DSM 509	52.0	+ 4.0	- 7.0 (p3/4)	(=p7)	WP
f BM 1949.WH1.1.13132	50.0	+ 6.0	- 5.0 (p5)	WP	(-0.5)
u/s USNM 535426	50.8	+ 7.0	- 7.0	n.r.	n.r.
u/s ACW 35	50.0	+ 5.0	- 6.5 (p3/4)	- 0.5	WP
<i>davidi</i>					
m(type)					
MCZ 129130	53.0	+ 8.0	n.r.	n.r.	n.r.
m ZIAS unnumbered	56.7	+ 5.4	- 7.2 (p3/4)	- 0.5	WP
m ZIAS					
100513/717-928	51.3	+ 5.4	broken	(=p7)	WP
m ZIAS					
168142/225-984	51.2	+ 5.9	- 7.4 (p3/4)	- 0.6	WP
f ZIAS					
100514/717-928	55.1	+ 5.8	- 6.8 (p4)	(=p7)	WP
f(juv)ZIAS 100521	51.2	+ 5.6	- 6.6 (p4)	- 0.7	WP
f MCZ 129131	51.0	+ 6.0	n.r.	n.r.	n.r.
u/s ZIAS					
168143/225-984	53.8	+ 6.1	- 6.9 (p3/4)	- 0.2	WP
<i>suschkini</i>					
m (type) ZIAS					
119568/466-960	54.1	+ 3.8	- 7.1 (p3/4)	(=p7)	WP
m ZIAS 100519	54.9	+ 4.4	abnormal/under-grown		WP
m ZIAS 100517/20-929	53.4	+ 4.3	- 7.4 (p3/4)	- 0.3	WP
f ZIAS 100518	51.4	+ 5.8	- 6.4 (p3)	- 0.4	WP
f ZIAS 100516/20-929	50.3	+ 7.2	- 5.3 (p5/4)	(=p7)	WP
u/s (juv)					
ZIAS 100526/6-927	50.7	+ 6.1	- 6.2 (p3)	- 0.8	WP

m = male; f = female; u = unsexed. Primaries numbered descendantly; ss indicates tip of 9th primary falls opposite tips of secondaries; p3/4 indicates tip of 9th primary falls between 3rd and 4th primaries, etc. WP = wing-point; n.r. = not recorded. Specimens in ZIAS measured by VL; those in MCZ by R.A. Paynter, Jr. and those in USNM by B. Beehler. All others by PDR.

Sightings of two rare raptors, Lesser Spotted Eagle *Aquila pomarina* and Pied Harrier *Circus melanoleucos*, in Pakistan

WILLIAM S. CLARK and ALEEM AHMED KHAN

Roberts (1991) reported only a single sight record in Pakistan for Pied Harrier *Circus melanoleucos*, and an unconfirmed sight record for Lesser Spotted Eagle *Aquila pomarina*. Thus it was with great interest that we saw and identified an individual of each species during January 1993. Clark later sighted another Lesser Spotted Eagle at Rawal Lake, the location of the original sight record. In addition, three Lesser Spotted Eagle specimens that were taken in Pakistan during the last century were examined in the Museum of Natural History at Tring, U.K.

The sightings were made during field trips conducted as part of a raptor field identification course being taught by the senior author.

A Lesser Spotted Eagle was seen at the Chashma barrage on the Indus River on 22 January 1993. It was seen first in the morning perched atop a 6 m high tree on a long narrow man-made spit or spur that extends into the lake behind and just west of the barrage. The eagle flushed as we approached and flew around us and landed in another tree behind our vehicle. We turned around and approached it slowly until we could see it clearly in the telescope. It was the dark brown colour typical of *Aquila* eagles. In flight it showed whitish patches at the base of the primaries on the upperwings, whitish uppertail-coverts, and a small white spot in the middle of its back. Its upperwing-coverts were a paler brown and contrasted with the darker brown back and flight feathers. While gliding, its wings were held bowed, with the wrists held above the body and the wingtips pointed downward. All of these are characters of Steppe Eagles *Aquila nipalensis* in their third summer plumage. We were unable to see the underwing. It flushed as we approached it closer and flew away across the lake.

We studied various guides, as we were not completely satisfied with the tentative identification as Steppe Eagle. We noted from Porter *et al.* (1981) that Lesser Spotted Eagle can also show the white mid-back patch but, since Tawny Eagle *A. rapax* was not covered in this guide, we did not know whether that species could show such a feature. We decided to return and look at the eagle again, concentrating on leg feathering, underwing pattern, and nostril shape.

Luckily, when we returned, it was perched again on the peninsula atop another tree. Over the next half-hour we observed it from a distance through a telescope. The stovepipe legs and rather narrow beak were observed, but