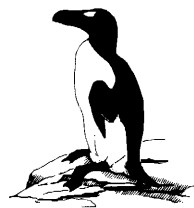


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A NEW BUSH-WARBLER (SYLVIIDAE, *BRADYPTERUS*) FROM TAIWAN

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ABSTRACT.—A bush-warbler of the genus *Bradypterus*, known from the mountains of Taiwan since 1917, has never been formally named as a distinct taxon. Songs of the Taiwan population differ strikingly from those of its Asian congeners in being much clearer, sweeter, more piercing, and in having a very different structure of elements. Several subtle but consistent morphological differences exist between specimens from Taiwan and all named taxa, principally in bill size and shape, plumage color and reduced variability, pattern of undertail coverts, and wing formula. Therefore, the Taiwan population is best treated as a new species. Received 17 December 1998, accepted 30 August 1999.

BRADYPTERUS BUSH-WARBLERS were first collected in the mountains of Taiwan in 1917 (Hachisuka and Udagawa 1951). The population initially was treated as *Bradypterus luteoventris* (Hodgson), which is a widespread species in southern Asia. Several specimens were depicted and discussed by Kuroda (1938), and the nesting was described by Yamashina and Yamada (1937). Hachisuka and Udagawa (1951) tentatively treated the Taiwan bird as “*B. luteoventris* subsp.?” but indicated that it should be compared with the race *B. l. melanorhynchus* (Rickett) of adjacent eastern China. In his revision of *Bradypterus*, Delacour (1943) overlooked the Taiwan population, but later, after Hachisuka sent him four specimens, Delacour (1952) concluded that Taiwanese and Thai specimens belonged to the taxon *idoneus*, which previously was known only from the holotype

from southern Vietnam. At that time, Delacour (1952) correctly reversed Seebohm’s (1881) synonymization of what has become known as *B. seebohmi* (Ogilvie-Grant) of southern Asia and the Philippines with *B. luteoventris*. However, Delacour entirely omitted the eastern Himalayan population named *B. mandelli* (Brooks); we use this name hereafter because it has priority over the name *B. seebohmi* (Dickinson et al. 1998). Most later authors referred the Taiwan population to the race from adjacent eastern China, *B. mandelli melanorhynchus* (Meyer de Schauensee 1984, Watson 1986, Cheng Tso-hsin 1987), and photographs of the Taiwan bird have appeared under the name *Bradypterus seebohmi* (Sha Qianzhong 1992:194–195).

More recently, PDR, FGR, and P. Alström (pers. comm.) realized, on the basis of its distinctive song, that the Taiwan form must be an undescribed species, and PCR could not identify specimens from Taiwan as either *B. man-*

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delli or *B. luteoventris*. Subsequent study of morphology and vocalizations has confirmed that the Taiwanese form is an undescribed species, which we propose to name:

Bradypterus alishanensis sp. nov.
Taiwan Bush-Warbler

Holotype.—National Museum of Natural History (USNM) 483830, adult female from Ta-Kuan, Hua Lian Hsien (=Ta-Kuan-Ts'un, Hua-Lien Hsien; 23°45'N, 121°25'E), Taiwan, about 48 km southwest of Hua Lien (along a railroad near a lumber camp named Ta Kuan) at about 1,270 m elevation (C. Fennell unpubl. data, archived at The Trust for Oriental Ornithology); collected 25 March 1960 by C. Fennell (Robert E. Kuntz collection on label), BH 952, NAMRU-2 Project.

Diagnosis.—Medium-sized, rather long-tailed, large-footed bush-warbler, with a relatively slender bill (cover, Table 1). Upperparts uniformly dark dull brown, throat whitish with vague to prominent small brown speckles concentrated in center, breast pale grayish-brown, flanks relatively drab brownish, and longest undertail coverts pale dull brown with indistinct whitish tips.

The following comparisons were made directly for 12 *B. alishanensis* specimens, photographs and measurements of another specimen studied separately (MKB 75422), and photographs only of five others at the Yamashina Institute (see Appendix). "Indirect comparison" as used below refers to comparisons of photographs and measurements. For consistency, all measurements were taken by PCR. Ascendant numbering (i.e. outer to inner) of primaries and maximum wing arc are used to provide consistency with previous work on sylviids (Svenson 1992:15–16, 20–21).

The Taiwan Bush-Warbler differs from the Spotted Bush-Warbler (*B. thoracicus*; $n = 65$) and the Siberian Bush-Warbler (*B. [t.] davidi*; $n = 11$) in having a much longer and less-rounded tail, with stiffer shaft tips on the rectrices. Compared with the latter two taxa, the plumage nearly lacks gray or rufescent tones, and the undertail coverts have much paler bases that contrast less with the tips.

Compared with Chinese Bush-Warblers (*B. tacsanowskii*; $n = 24$), *B. alishanensis* has a much longer, broader outermost primary (P1),

browner, less olive upperparts, and much narrower pale tips on the undertail coverts. Compared with *B. luteoventris* ($n = 26$; see cover), *B. alishanensis* differs structurally in having the bill tip slightly wider (from above) and more evenly tapered (on side view). Its plumage differs in that the throat is speckled, the upperparts are redder, the sides lack bright yellowish-buff, the undertail coverts have more definite pale tips, and the upper surface of the rectrices is paler than *B. luteoventris* (Table 2). Adult *B. alishanensis* also have a partially or entirely dark lower mandible (vs. always pale in *luteoventris*), and the interramal skin often is unfeathered and dark (vs. white-feathered in *luteoventris*).

Compared with *B. m. mandelli* ($n = 24$, indirect comparison with 14 others; see Dickinson et al. 2000 for revised racial boundaries), *B. alishanensis* differs structurally in its finer, narrower bill, with a smaller gonydeal angle; narrower and less-exposed nares; longer wings, with a broader inner "hand"; less-pointed tips to fresh rectrices; and larger feet (Table 1). *Bradypterus alishanensis* has drabber brown upperparts, a narrower white throat owing to the brown malar region, and a stronger pale supercilium above and behind the eye (cover, Table 2). The throat speckling is variable but usually is most distinct on the center of the throat, with at most a few speckles on the uppermost breast. In contrast, in spotted *B. mandelli*, the speckles are heaviest on the upper breast. No *B. alishanensis* specimens exhibit the large dark throat spots found in some *B. mandelli*. The sides of the breast are much less variable in color, being dull pale grayish-brown; the flanks lack or have a weaker cinnamon tinge; the distal undertail coverts are much paler brown, with less contrastingly pale tips; and the tail is paler (Table 2). Overall, *B. alishanensis* is more uniform brown and much less variable in plumage than *B. mandelli* (cover).

Compared with the eastern Chinese race *B. mandelli melanorhynchus* ($n = 5$, indirect comparison with 5 others), *B. alishanensis* differs as from *B. m. mandelli*, but *B. m. melanorhynchus* is more similar to *B. alishanensis* in color of upperparts and in wing formula (Tables 1, 2). Compared with the two known specimens of the southern Vietnam race in which Delacour (1952) placed Taiwan birds (*B. mandelli idoneus*, $n = 1$, indirect comparison with 1 other), *B. ali-*

TABLE 1. Summary statistics ($\bar{x} \pm SD, n$) for measurements of members of the *Bradypterus mandelli* complex. All measurements are in mm.

Variable	Taxon ^a			
	<i>mandelli</i>	<i>melanorhynchus</i>	<i>idoneus</i>	<i>alishanensis</i>
Culmen from skull	14.2 ± 0.5, 35	13.4 ± 0.7, 10*	13.3	14.2 ± 0.8, 11
Bill height at nares	3.1 ± 0.1, 36	3.1 ± 0.1, 12	3.2	2.9 ± 0.2, 12
Bill width at nares	2.8 ± 0.2, 37***	2.8 ± 0.2, 12***	2.9	2.5 ± 0.1, 12
Unfeathered nares length	1.4 ± 0.2, 38**	1.5 ± 0.4, 11**	1.3	1.1 ± 0.3, 12
Wing length (max. arc)	51.9 ± 2.4, 35***	51.3 ± 2.1, 12***	51.0 ± 1.4, 2	54.1 ± 1.5, 12
P6 shortfall ^b	1.4 ± 0.7, 30**	1.2 ± 0.2, 10*	0.4 ± 0.6, 2	0.6 ± 0.7, 9
P7 shortfall	2.7 ± 0.7, 28***	2.4 ± 0.4, 10*	1.4 ± 0.2, 2	1.9 ± 0.4, 9
P8 shortfall	4.1 ± 0.8, 27	3.5 ± 0.5, 9	2.4	3.4 ± 0.4, 10
P9 shortfall	5.3 ± 0.9, 26***	4.5 ± 0.3, 9	4.0 ± 0.8, 2	4.5 ± 0.4, 10
P10 shortfall	6.5 ± 0.9, 26***	5.8 ± 0.3, 9	5.1 ± 1.5, 2	5.5 ± 0.6, 9
P3 distal width	5.7 ± 0.5, 33	6.0 ± 0.4, 11	5.8 ± 0.6, 2	6.0 ± 0.3, 10
Tarsus length	19.0 ± 0.8, 38**	18.4 ± 0.7, 11***	18.7 ± 0.9, 2	19.8 ± 0.8, 12
Tarsus proximal depth	2.4 ± 0.2, 38	2.3 ± 0.3, 12*	2.4 ± 0.3, 2	2.5 ± 0.2, 12
Tarsus distal width	2.5 ± 0.1, 37***	2.4 ± 0.2, 12***	2.3 ± 0.7, 2	2.7 ± 1.3, 11
Midclaw length	3.9 ± 0.3, 37***	3.7 ± 0.3, 12**	4.3 ± 0.6, 2	4.2 ± 0.2, 12
Hallux claw length	6.2 ± 0.4, 33***	5.9 ± 0.3, 11***	5.7 ± 1.0, 2	6.8 ± 0.3, 12
Tail length	58.9 ± 3.3, 29	56.0 ± 3.1, 10**	58.1	60.3 ± 1.9, 8
				15.0 ± 0.9, 26*
				3.3 ± 0.1, 26***
				2.7 ± 0.5, 27***
				1.9 ± 0.4, 27***
				53.3 ± 1.1, 27
				0.9 ± 0.5, 7
				2.0 ± 0.4, 5
				3.0 ± 0.8, 6
				4.2 ± 0.7, 5
				5.1 ± 0.8, 4
				6.4 ± 0.2, 17**
				20.7 ± 0.7, 27***
				2.9 ± 0.2, 24***
				2.9 ± 0.2, 27*
				4.2 ± 0.3, 27
				6.4 ± 0.4, 27***
				60.1 ± 2.9, 23

^a Asterisks denote significance levels from two-sample *t*-tests comparing *B. alishanensis* with the taxa indicated (*idoneus* not tested). *, $P \leq 0.05$, **, $P \leq 0.01$, ***, $P \leq 0.001$.

^b "Shortfall" is distance between named primary and longest primary (i.e. wing point).

TABLE 2. Summary statistics ($\bar{x} \pm \text{SD}$, n) for colorimetric comparisons (using a Minolta CR-221 chromometer) between *Bradypterus alishanensis* and related taxa. Higher values of L indicate increasing lightness, higher values of a increasing redness (vs. greenness), and higher values of b increasing yellowness (vs. blueness). Significance levels as for Table 1.

Variable	Taxon				
	<i>mandelli</i>	<i>melanorhynchus</i>	Type of <i>idoneus</i>	<i>alishanensis</i>	<i>luteoventris</i>
Crown					
L	29.4 \pm 1.6, 25	30.2 \pm 1.4, 5	25.2	29.3 \pm 2.5, 5	29.7 \pm 1.1, 18
a	6.0 \pm 0.6, 25*	5.3 \pm 0.8, 5	5.6	5.4 \pm 0.4, 5	4.9 \pm 0.5, 18*
b	15.0 \pm 1.4, 25	14.6 \pm 1.3, 5	14.5	14.9 \pm 0.7, 5	14.6 \pm 1.1, 18
Mantle					
L	29.9 \pm 1.7, 24	29.7 \pm 0.8, 5	27.1	29.8 \pm 2.2, 5	31.0 \pm 1.0, 18
a	6.0 \pm 0.7, 24*	5.8 \pm 0.5, 5	5.2	5.1 \pm 0.6, 5	4.7 \pm 0.6, 18
b	16.5 \pm 1.4, 24*	16.5 \pm 1.3, 5	14.7	15.3 \pm 0.8, 5	16.1 \pm 1.6, 18
Sides of breast					
L	45.6 \pm 3.5, 27	48.4 \pm 7.3, 3	51.7	43.6 \pm 2.6, 5	51.4 \pm 2.9, 23***
a	3.3 \pm 1.3, 27	2.0 \pm 1.0, 3	1.4	2.8 \pm 0.8, 5	3.3 \pm 1.2, 23
b	15.2 \pm 4.0, 27	11.6 \pm 6.4, 3	13.6	14.3 \pm 3.2, 5	20.9 \pm 3.0, 23**
Longest undertail coverts					
L	39.9 \pm 2.2, 15***	42.1 \pm 1.6, 4*	41.4	46.5 \pm 3.3, 5	46.2 \pm 3.7, 20
a	3.9 \pm 0.6, 15*	3.9 \pm 0.3, 4	3.1	4.8 \pm 0.8, 5	5.1 \pm 0.7, 20
b	14.3 \pm 1.8, 15**	15.3 \pm 1.3, 4**	15.5	19.3 \pm 2.0, 5	21.5 \pm 2.7, 20
Upper surface of central rectrix					
L	29.5 \pm 1.5, 16**	30.2 \pm 1.5, 4	27.5	32.3 \pm 1.5, 5	29.6 \pm 2.2, 21**
a	5.0 \pm 0.4, 16	5.2 \pm 0.3, 4	4.5	5.0 \pm 0.4, 5	5.2 \pm 0.3, 4
b	11.2 \pm 1.2, 16*	12.7 \pm 1.0, 4	9.2	12.8 \pm 1.2, 5	13.1 \pm 1.6, 21

alishanensis again differs much as from nominate *B. m. mandelli* (Tables 1 and 2). However, *B. m. idoneus* has an even broader innerwing than *B. alishanensis*, and its upperparts are darker than those of *B. alishanensis*, but are equally drab.

Compared with the unique type specimen of *Bradypterus [montis] seebohmi* of Luzon, *B. alishanensis* has a finer bill, more extensively feathered nares, longer wings, and less-rounded tips to the rectrices (measurements in Dickinson et al. 2000). In plumage, *B. alishanensis* has a browner rear supercilium and lower face, less russet upperparts and wing edgings, much paler bases and much less well-marked pale tips to the undertail coverts, and lacks gray-and-white striations on the throat and sides of the breast.

Compared with the Javan Bush-Warbler (*B. montis*; $n = 6$, indirect comparison with 36 others and photos of 1 to 2 live birds in Rozendaal [1989]), *B. alishanensis* differs structurally (Table 1) in its smaller size; smaller, less-rounded, and much more extensively feathered nares; smaller bill and legs; narrower rectrices; proportionately longer wings; and distally nar-

rower outer primaries. In plumage, the upperparts of *B. alishanensis* are much less russet, the fresh feathers (especially rectrices) are less decomposed, the rear supercilium and auriculars are browner, the supercilium is more prominent before and above the eye, the breast is less gray, the underparts lack dark streaks, the flanks are drabber, the undertail coverts have much paler bases and less contrastingly pale tips, and the tail is much paler. The legs of typical *B. alishanensis* are paler than those of many adult *B. montis* specimens. The juvenal plumage is browner and much more uniform below, lacking the strong yellowish suffusion and streaked appearance below of juvenal-plumaged *B. montis*.

Compared with *B. [montis] timorensis* ($n = 2$, measurements in Dickinson et al. 2000), *B. alishanensis* has a finer bill, longer wing, and shorter tail. In plumage, the upperparts are darker and much less reddish than those of *B. timorensis*; the breast, rear auriculars, and lower face are browner; the supercilium is more prominent and whiter in front of the eye; the malar area is browner and darker; the auricu-

lars are darker with more evident shaft streaks; the flanks are drabber; and the pale tips on the undertail coverts are slightly more marked.

Description of holotype.—Color designations are from the Munsell color chart for plant tissues. Comparisons of the holotype with color chips were made by PCR under fluorescent lighting. The crown from narial feathers to nape is uniform dark brown (5 YR 3/3), the feathers with slightly darker tips. The supercilium is dull pale buff (paler and less pink than 7.5 YR 8/4), extending from the nares to the rear edge of auriculars; it is moderately well marked and unbroken in front of and above the eye, and weak behind the eye. The lores have a small blackish-gray patch, extending as a thin dark line below the front half of the eye. The auriculars have fine white shaft streaks on a uniform medium brown (7.5 YR 5/3) background. This color extends to the malar region, where it is slightly paler. The chin and narrow throat are white, with many vague, fine (1.5 mm or smaller), pale brown (7.5 YR 7/3) speckles and a few crisp, fine (0.6 mm), very dark brown (7.5 YR 4/2) speckles in the center of the throat.

The upperparts from nape to wing and uppertail coverts are the same color as the crown, but without the slightly scaled appearance. The remiges have similarly colored outer edges, but the rest of each remex is slatier and darker (5 YR 4/2). The sides of the neck are slightly darker brown than the auriculars and lack visible white shaft streaks. The lower throat and upper breast grade from the white of the throat to pale cold brown (7.5 YR 6/3), darker on sides of the breast. The sides and flanks are darker brown (less red than 7.5 YR 4/4) and do not grade into unmarked whitish central underparts from lower breast to lower belly. The undertail coverts are pale brown (7.5 YR 6/4) and have beige (7.5 YR 8/2) tips that are about 3 mm wide on the longest coverts, the tip not sharply demarcated from the rest of the feather. The uppertail surface is dark brown (7.5 YR 4/2) with vague transverse barring (pale bars ca. 1.1 mm, dark bars ca. 0.8 mm). The tips of fresh rectrices are gently rounded, and the under surface of the rectrices is a paler, grayer brown (5 YR 5/2) than the upper surface. The tail has 12 rectrices; the distance from the longest to shortest rectrix is 30 mm; all rectrices are very fresh. The underwing linings and axillaries are

pale beige (paler than 7.5 YR 8/4); the underwing primary coverts have large medium gray (7.5 YR 5/2) centers; the undersurfaces of remiges are also medium gray, with paler edges of inner webs. The bill is rather fine, on lateral view grading evenly toward the tip. The narial feathering extends distally to cover much of the nares. In the dried skin, the maxilla is blackish except for the tip, which is paler. The mandible is blackish-horn with a yellowish-horn gonyleal edge. The bare interramal skin is dusky, and visible rictal bristles are absent. The feet and claws of the dried skin are pinkish horn, and the claws are tipped darker.

Measurements of holotype.—Overall length 132 mm (C. Fennell unpubl. data); wing (maximum arc) 53.0 mm; tail 60.4 mm; tarsus 18.4 mm; culmen from skull base 14.2 mm (see also Table 1).

Distribution.—*Bradypterus alishanensis* is resident with some seasonal elevational movements in the mountains of north-central and central Taiwan. Apparently, it is rare (one sight record) at low elevations (see Fig. 1, Appendix). It is a common breeding bird between 1,200 and 3,000 m in at least two major areas (Yamashina and Yamada 1937).

Specimens.—See Appendix for designation of paratypes and their data, and for data from other specimens. Visualization of cranial ossification in radiographs on lateral and ventral views shows that the four AMNH specimens and those in the type series from USNM and YPM have fully pneumatized skulls.

Soft-part colors.—See Appendix.

Etymology.—This species is named after the A-li Shan (=Mt. Ari, Arisan, Ali-Shan), on which the first specimens were collected by Dr. Motoki and Y. Kikuchi in 1917. This montane locality is one of two main breeding areas known for the species. The proposed English name has not been applied to other taxa and emphasizes the endemism of this previously overlooked species.

Variation.—One "melanistic" specimen of *B. alishanensis* is known (Kuroda 1938) but has not been reexamined for this study. However, because that specimen was dark brown, not black, it is possible that *B. alishanensis* has pale and dark morphs. The holotype is slightly more rufescent above than any of the paratypes. Three of the paratypes have more and darker throat speckling than the holotype; the others are comparable to the holotype in this respect. Our

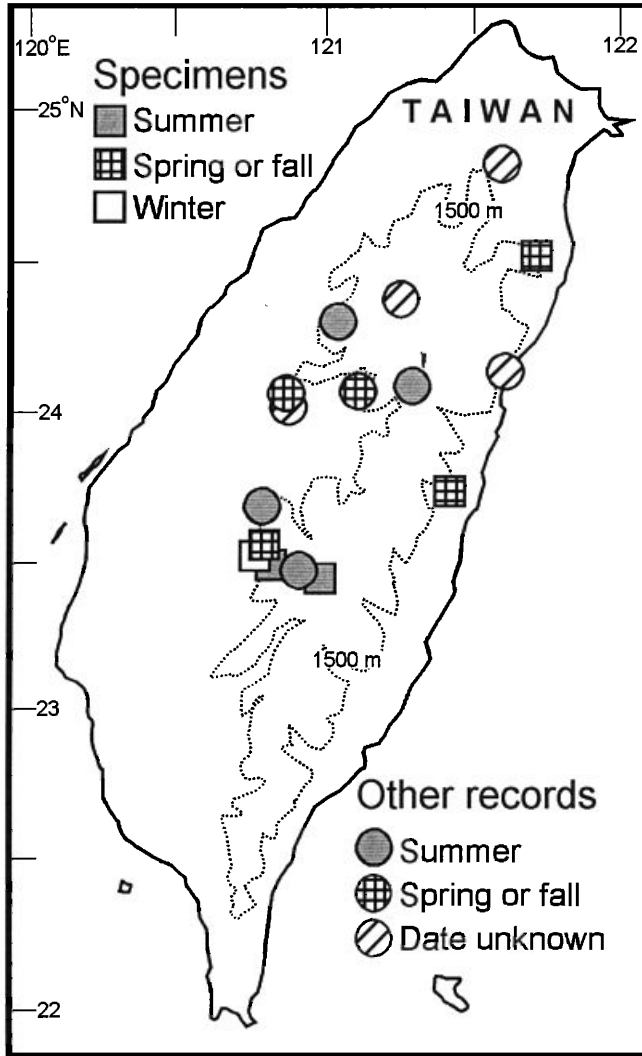


FIG. 1. Known localities for *Bradypterus alishanensis* (see Appendix).

examination of the series confirms Kuroda's (1938) contention that degree of throat speckling is independent of age, season, or sex; the only definite first-fall specimen (YI 14853) and the juvenile paratype are similar in this character to adults of both sexes from various seasons. The rectrices of worn July and November specimens have protruding shafts (as much as 5 mm in one); an October specimen has fresh rectrices. The first-fall bird (determined by its obviously more-pointed fresh rectrices) is slightly darker above than the others but otherwise is very similar. It and the juvenile paratype are the only specimens with entirely pale

lower mandibles, suggesting that adults have mainly dark bills year-round. The series confirms that *B. alishanensis* has reduced levels of plumage variation compared with intralocality variability in *B. m. mandelli* and *B. m. melanorhynchus*.

Vocalizations.—The song of *B. alishanensis* differs markedly from those of related taxa for which vocalizations are known (Fig. 2). The song of *B. luteoventris* is an insect-like staccato, dry, reeling *tk tk tk tk tk tk* that continues unbroken for several seconds (Fig. 2).

The song of *B. m. mandelli* (Fig. 2) is a frenzied yet mechanical combination of nasal and

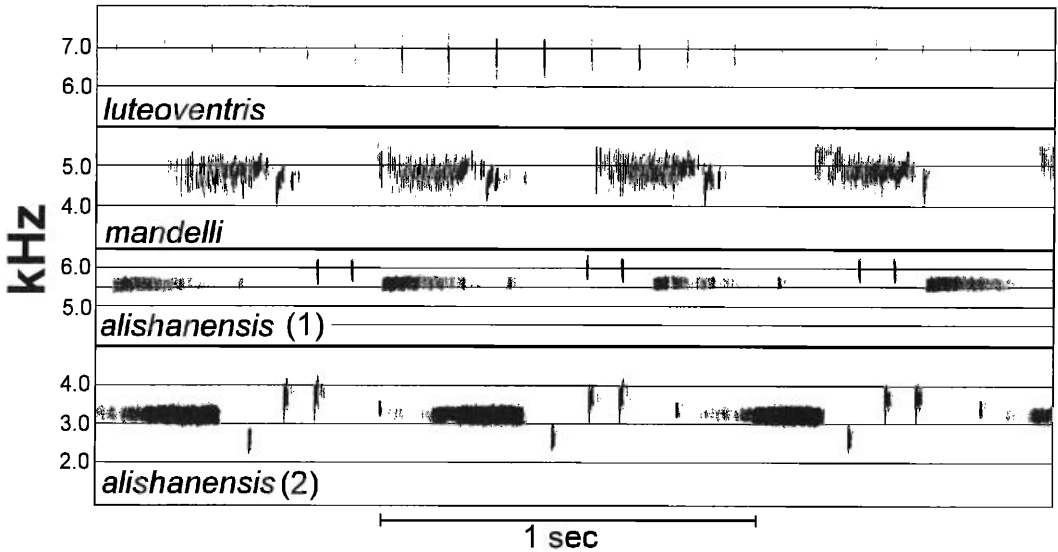


FIG. 2. Sonagrams (made on a Kay Digital Sono-Graph 7800) of the songs of *Bradypterus luteoventris*, Ba Bao Shan, Guangdong Province, China, June 1988; *B. mandelli*, Ba Bao Shan, 15 June 1988; and *B. alishanensis*, (1) Taipin, 2 March 1987, and (2) Shitou, 15 April 1990. All recordings by P. Kennerley except (1), by Liu Yi-Hua.

metallic notes, which has been rendered as *creet-ut* or *zee-bit* (Round 1992). The first element is a buzzing, nasal *bzeent*, immediately followed by a very short, metallic clicking, the latter shown on the sonagram to be comprised of multiple elements. The individual songs are repeated about every 0.8 s, and each lasts about 0.3 to 0.4 s, being separated by intervals of about 0.15 to 0.3 s. The buzzing main notes last between 0.2 to 0.3 s, and the frequency of the entire song is centered at around 4.75 kHz, ranging from 4.0 to 5.5 kHz. Other recordings of both *B. m. mandelli* and *B. m. melanorhynchus* show a very similar pattern, although some range to 6.5 kHz, and songs from Emei Shan are much lower in pitch (2.0 to 3.0 kHz). A recording of *B. m. idoneus* from Da Lat, Vietnam, has a similar note length and burry quality and sounds much like *B. mandelli*, but the main element is preceded by two sharp notes rather than being followed by just one (Round 1992, P. Alström pers. comm.).

The song of *B. alishanensis* is a loud, rapidly repeated series of clear monotones without the nasal and buzzy quality of *B. mandelli* (Fig. 2). Each song ends in two or three castanet-like clicks that lack the metallic quality of *B. mandelli* songs. Each phrase lasts from about 0.6 s (two terminal clicks) to 0.75 s (three terminal

clicks), with the main clear element lasting about 0.33 s. The frequency of one song sequence with two terminal clicks is centered at about 5.7 kHz and ranges between about 5.4 and 6.25 kHz (the terminal clicks are highest). Another, with three terminal clicks, is centered at 3.5 kHz and ranges between about 2.25 and 4.0 kHz; the clicks form the highest and lowest portions of this song. In a recording of two individuals singing simultaneously, their frequencies differ greatly. In none of the several recordings we have heard for both *B. alishanensis* and *B. mandelli* does the song of one species sound similar to the other, and their songs sound even more different than they appear on the sonagrams.

One of the calls of *B. alishanensis* is a loud, persistent, very rapid and scratchy, *ksh ksh ksh*, lasting several seconds (Ho Huan San, 20 April 1987, 2,500 m, Liu Yi-Hua recording). This call also is given in a seemingly less-intense form with higher, more irregular, more tweeting and piping notes, at least sometimes ending in a song (same recording). Calls of *B. mandelli* in Thailand taped by PDR are of similar quality; however, the notes are less insistent but more distinct and well spaced and have been described as an excited *chut chut chut*

(Round 1992). It is unclear whether these differences between the taxa are consistent.

Juvenal and immature plumages.—Nestlings were described by Yamashina and Yamada (1937) and Hachisuka and Udagawa (1951), and the juvenal plumage was described and depicted by Kuroda (1938). The plumage of the juvenile paratype (YI 25297) fits Kuroda's description and is similar to the juvenal plumage of *B. mandelli* (Dickinson et al. 2000).

REMARKS

Breeding.—Many aspects of the breeding biology of *B. alishanensis* have been described by Yamashina and Yamada (1937), Kuroda (1938), and Hachisuka and Udagawa (1951), who gave the breeding season as mid-May to the end of June. However, Wu Sen-Hsiong (pers. comm.) photographed a bird carrying food in August. Owing to the long-term synonymy of *B. mandelli* with *B. luteoventris*, the lack of reliably identified eggs of the former precludes comparisons with the eggs of *B. alishanensis* described by Yamashina and Yamada (1937).

Habits and ecology.—The Taiwan Bush-Warbler sings mostly in the morning during the breeding season and also on moonlit nights (Kuroda 1938); it was recorded singing persistently at 1730 on 15 April 1990 (P. Kennerley pers. comm.). Apparently, it also vocalizes during winter months in nonbreeding localities (Wu Sen-Hsiong pers. comm.). The holotype (sexed as a female) was collected while it sang in high grass about 0.5 m above the ground, and its stomach contained small insects (C. Fennell unpubl. data). Whether females normally sing is unknown.

Habitat and conservation.—Taiwan Bush-Warblers are considered common at Arisan Village (Yamashina and Yamada 1937, B. King pers. comm.) and occur in undergrowth at forest edges, grasslands, tall grass surrounded by conifers and broadleaf evergreens, and dense ferns on open slopes with isolated trees (P. Kennerley, B. King, J. Scharringa, and Wu Sen-Hsiong pers. comm.). Clearly, they exist in disturbed habitats and thus are unlikely to be in immediate danger, especially because they breed in at least two major mountainous areas. Recent field observations have shown that in mainland Asia, *B. luteoventris* breeds in montane grasslands and dwarf bamboo, and *B.*

mandelli breeds on lightly wooded or brushy hillsides; both move to lower elevations in winter (C. Robson and P. Kennerley pers. comm.). Taiwan Bush-Warblers breed from 1,200 to more than 3,000 m, perhaps reflecting the lack of competing congeners in Taiwan.

Taxonomy.—Although Delacour (1952) asserted that the Taiwan specimens are similar to the type of *B. m. idoneus* ("if seasonal and individual variation and age are taken into account"), the similarity is superficial. Most of the distinctions between *B. alishanensis* and *B. m. mandelli* apply equally to *B. m. idoneus* (Tables 1 and 2), and none can be attributed to the kinds of variation invoked by Delacour. Even if *montis* and *timorensis* were treated as subspecies of *mandelli* (see Dickinson et al. 2000) *B. alishanensis* should be considered a separate species because its vocalizations differ strongly from all of the forms in which song is known. Voice is unknown in *timorensis*, which is very different from *alishanensis* in morphology. The songs of *montis* (Rozendaal 1989) and *seebohmi* of Luzon (S. Harrap and D. Allen pers. comm.) are much more similar to that of *B. mandelli* than the song of either is to that of *B. alishanensis*.

The songs of *B. mandelli* and *B. alishanensis* are so different that it seems highly unlikely that interbreeding could occur regularly should these birds come into contact. Conversely, the songs of *B. mandelli* are fairly consistent throughout its large range, with only *idoneus* differing somewhat. The songs of *Bradypterus* species are highly stereotyped and presumably are pivotal in species recognition in these extremely skulking, drab-plumaged birds. Thus, *B. alishanensis* clearly fulfills the requirements of the phylogenetic species concept in terms of its monophyly and distinctiveness. It is almost certainly reproductively isolated as well owing to its unique song and allopatry, and thus it should be treated as a biological species.

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APPENDIX. Specimen records (in chronological order) and recent sight and tape-recording records^a of *Bradypterus alishanensis*. Under "Remarks," data from specimen labels or field notes are enclosed in quotation marks, and the authors' determinations are enclosed in brackets.

Locality	Date	Elevation (m)	Collector/observer	Remarks
Ali-shan (23°30'N, 120°40'E)	21 Jan 1917	—	Motoki/Y. Kikuchi	Discussed by Hachisuka and Udagawa (1951); not traced
Ali-shan	18 Apr 1919	—	—	Figured as no. 1 in Kuroda (1938); [ad.] "male"; not traced
Taipei-shan, Taipei-zhou (=Taiheisan, Taikoku) ^b	12 Sep 1932	1,667 to 1,980	—	AMNH 348370 ^c (formerly YI 14647); [ad.] "male, iris clove brown, bill clove brown/gray, feet drab"
Taipei-shan ^b	6 Oct 1932	1,815	H. Orii	YI 14853; "ad. female" ([1st-winter by plumage], "iris sepia, bill clove-brown/drab, feet drab"
Taipei-shan ^b	7 Oct 1932	1,980	H. Orii	YI 14869, (photograph only)
Ali-shan, Tainan-zhou ^b (24°30'N, 121°30'E)	26 Mar 1933	2,000 to 2,500	H. Orii	YI 15681, (photograph only)
Ali-shan, Tainan-zhou ^b	5 Apr 1933	2,000 to 2,500	H. Orii	AMNH 348372 ^c (formerly YI 15778), [ad.] "female", figured as no. 3 in Kuroda (1938) "iris clove brown, bill slate gray/gray, feet pearl white"; YI 15779; [ad.] "male, iris clove-brown, bill slate gray/gray, feet ecru drab"
Ali-shan, Tainan-zhou ^b	9 Apr 1933	2,000 to 2,500	H. Orii	AMNH 348373 ^c (formerly YI 15814), [ad.] "female", figured as no. 2 in Kuroda (1938), "iris clove brown, bill slate/gray, feet ecru drab"; YI 15815; [ad.] "male, iris clove-brown, bill slate gray/gray, feet ecru drab"
Ali-shan, Tainan-zhou ^b	13 Apr 1933	2,000 to 2,500	H. Orii	YI 15837, (photograph only)
Ali-shan, Tainan-zhou ^b	29 Jun 1935	—	N. Yamada	YI 21597 ^c , "ad. male" [drawing of left testis 1.0 mm], photo of nest with 2 eggs (Yamashina and Yamada 1937)
Ali-shan, Tainan-zhou ^b	4 Jul 1935	—	N. Yamada	AMNH 348371 ^c (formerly YI 21598), "ad. male" [drawing of left testis 1.7 mm]
Ali-shan, Tainan-zhou ^b	10 Jul 1935	—	N. Yamada	1-2 nests (Yamashina and Yamada 1937)
Ali-shan, Tainan-zhou ^b	1 Aug 1935	2,000 to 2,500	N. Yamada	YI 21599, (photograph only)
Ali-shan, Tainan-zhou ^b	14 Jul 1936	—	N. Yamada	YI 20995 ^c , "ad. male" [drawing of left testis 1.7 mm]
Ali-shan, Tainan-zhou ^b	5 Oct 1936	—	T. Kazano	Tainan Museum (melanistic), ad., figured as no. 5 in Kuroda (1938); specimen not seen
Ali-shan, Tainan-zhou ^b	6-7 Jul 1937	—	N. Yamada	2 fledglings; YI 25299 (photograph seen); YI 25296 (not seen; Yamashina and Yamada 1937)
Ali-shan, Tainan-zhou ^b	9 Jul 1937	—	N. Yamada	2 fledglings; YI 25297 ^c , "male"; YI 25298 (probably that figured as no. 4 in Kuroda 1938; photograph only)
Ali-shan, Tainan-zhou ^b	pre-1939	—	—	Two specimens mentioned by Hachisuka and Udagawa (1951); not traced
Ta-Kuan, Hua Lian Hsien (23°45'N, 121°25'E)	25 Mar 1960	—	C. Fennell (R. E. Kuntz on label)	USNM 483830, [ad.] "female, ovaries slightly enlarged"; holotype
Chao-p'ing, Ali-shan	4 Jul 1961	2,250	H. Morioka	YPM 40195; [ad.] "male"

APPENDIX. Continued.

Locality	Date	Elevation (m)	Collector/observer	Remarks
Ho-Huan San (24°08'N, 121°19'E)	30 May 1975	3,270	R. de Naurois	MKB 75422; "male, 13 g"
Ali-shan	19 Apr 1983	2,100 to 2,200	J. Scharringa	Seen vocalizing
Ho-Huan San	Aug 1983	3,100	Wu Sen-Hsiung	Photographed feeding young at nest ^a
Shitou (23°40'N, 120°48'E)	12 Jul 1984	1,500	J. Scharringa	Tape-recorded
Shitou	1 Jul 1985	1,100 to 1,500	Liu Yi-Hua	Tape-recorded ^b
Taipin (24°06'N, 120°49'E)	2 Mar 1987	400 to 500	Liu Yi-Hua	Tape-recorded ^a
Ho Huan San (24°07'N, 121°14'E)	20 Apr 1987	2,500 to 3,100	Liu Yi-Hua	Tape-recorded ^a
Shitou	15 Apr 1990	1,500	P. Kennerley	Tape-recorded
Shitou	Jan	1,100	Wu Sen-Hsiung	— ^a
Ali-shan (23°31'N, 120°48'E)	28 Sep 1996	2,400	Wu Sen-Hsiung	— ^a

^a Taiwan Wild Bird Information Center. Additional but undated records: An-Ma San, 24°16'N, 121°01'E, summer, 2,665 m; Ta-Ta Chia Anbu, 23°28'N, 120°53'E, summer, 2,600 m; Ta-Hen Pin San, 24°04'N, 120°49'E, winter, 1,000 m; Fu San Botanical Garden, 24°48'N, 121°39'E, 1,000 m; Thailoko, 24°09'N, 121°39'E, winter, 50 m; Da-Shwe San, 24°23'N, 121°15'E, summer, 3,200 m.

^b Hiraoka Takashi pers. comm.

^c Paratypes.