Morphological variation and taxonomic revision of five south-eastern subspecies of Lesser Whitethroat *Sylvia curruca* (L.) (Aves: Sylviidae)

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Individual, sex, age, seasonal and geographic variation of size and plumage coloration of Lesser Whitethroat *Sylvia curruca* (Linnaeus, 1758) was studied on more than 1100 bird skins from all parts of its breeding range. The results of analysis of birds from the south-eastern part of the breeding range of the species support the validity of five light-coloured subspecies: *halimodendri* Sushkin, 1904, *telengitica* Sushkin, 1925, *snigirewskii* Stachanow, 1929, *minula* Hume, 1873, and *margelanica* Stolzmann, 1897. Their diagnoses and ranges are refined and supplemented. Numerous phenotypically intermediate birds from intergradation zones between the subspecies show that these five together with the two northern dark-coloured forms *S. c. curruca* and *S. c. blythi* Ticehurst & Whistler, 1933, undoubtedly belong to a single species, and not to three species as in Shirihai et al. (2001).

Introduction

The Lesser Whitethroat *Sylvia curruca* (Linnaeus, 1758), a dweller in various shrubby habitats, is widely distributed in Eurasia, reaching from the taiga zone in the north to the sandy deserts in the south, from Britain in the west to Mongolia and China in the east, and from plains at sea-level up to 2000 m a.s.l. in mountains. Due to the considerable differences in natural conditions across such a wide breeding range, and also due to the difference in length of migration routes of the various populations and the position of their winter quarters, geographic variation of plumage colour and size of birds is significant. Ten forms have been described, quite a number of them based on birds collected during migration or in winter quarters: *curruca*, *minula* Hume, 1873, *blythi* Ticehurst & Whistler, 1933, *margelanica* Stolzmann, 1897, *halimodendri* Sushkin, 1904, *caucasica* Ognev & Ban'kovski, 1910, *telengitica* Sushkin, 1925, *jaxartica* Snigirewski, 1929, *snigirewskii* Stachanow, 1929, and *chuancheica* Portenko, 1929 (Hume, 1873, 1878; Stolzmann, 1897; Sushkin, 1904, 1908, 1925; Ognev & Ban'kovski, 1910; Snigirewski, 1927, 1929; Stachanow, 1929; Portenko, 1955), but opinions of modern taxonomists differ widely as to the number of species (1-2) and subspecies (6-9) to be recognised, and especially on the breeding distribution of the various taxa. Many taxonomists treat Hume's Whitethroat (*S. althaea* Hume, 1878) as just a subspecies of the Lesser Whitethroat (Volchanetski, 1954; Portenko 1960; Walters, 1980; Watson, 1986; Roselaar in Cramp, 1992; Baker, 1997), in spite of a much larger gap in its morphology and breeding biology compared to the other forms of *S. curruca*. The species status of *S. althaea* as proposed by

Snigirewski (1929) and Vaurie (1959) was later on confirmed by a complex of morphological features and especially by its reproductive isolation from parapatric *S. curruca* (Korelov, 1972; Stepanyan, 1983; Loskot 2001a). A short review of the history of the exploration of geographical variation in the *S. curruca - S. althaea* superspecies, the changes in views on its taxonomy in the last century, as well as results of the study of type specimens of six subspecies was published recently (Loskot, 2001b). At the same time a monograph on *Sylvia* warblers was published (Shirihai et al., 2001), presenting a new proposal for the taxonomy of this superspecies. In the latter paper, the authors adopted a rather narrow species and a rather wide subspecies concept; they split the complex into four allospecies, three of them being monotypic (*S. minula, S. margelanica* and *S. althaea*) and one polytypic (*S. curruca*), the latter with two subspecies only, *S. c. curruca* and *S. c. halimodendri*. Because of the apparent differences in opinion, it was decided to assess the intraspecific variation of plumage coloration and size in *S. curruca* in more detail by examining as large a sample of collected specimens as possible, with emphasis on birds from the breeding grounds. Having dealt earlier with *S. althaea* (Loskot, 2001a), this publication addresses the taxonomy of the most controversial group of forms of *S. curruca*, mostly from Kazakhstan, the Altai, and Middle and Central Asia.

Material and methods

Individual, sex, age, seasonal and geographic variation of more than 30 parameters of external morphology (colour of different parts of the plumage; linear measurements of all primaries, the first secondary, the second pair of rectrices, the longest primary covert, tarsus and bill) were examined on more than 1100 bird skins from all parts of the species breeding range. In the description of plumage, moult and age classes the terminology suggested by Jenni & Winkler (1994) was used, albeit with some modifications (see Loskot & Daletskaya, 2001, for details). Primaries were numbered from the outermost (P1) inward, rectrices from the central pair (R1) outward. Character states for the identification of age, seasonal plumages, and subspecies were established. As a result, many specimens were identified or re-identified at the subspecies level. The presence of the relevant type specimens, from which the same 30 parameters were obtained (see Loskot, 2001b), was of great help in subspecies assessment.

Results

1. Sex differences

On average, males are slightly larger than females and the two do not differ essentially in plumage coloration. Sex differences in wing length are statistically significant in four out of five forms examined, and in *S. c. snigirewskii* and *S. c. telengitica* males and females are significantly different in tail length as well (table 1). Thus, pooling these biometric data across birds of different sexes in comparing birds of different subspecies in some earlier works and modern summaries (Snigirewski, 1929; Portenko, 1950; Williamson, 1968; Roselaar in Cramp, 1992; Shirihai et al., 2001) is not fully justified. The levels of sex differences in tarsus and bill length are statistically insignificant.

Table 1. Significance levels from two-sample t-tests comparing size of sexes in different subspecies of *Sylvia curruca*.

Taxon	Wing length			Tail length		
	t	df	p	t	df	p
S. c. halimodendri	1.24	56	ns	0.94	58	ns
S. c. snigirewskii	5.06	42	<0.001	2.98	42	<0.01
S. c. telengitica	3.24	34	<0.01	2.14	34	<0.05
S. c. minula	2.34	120	<0.05	0.61	120	ns
S. c. margelanica	5.08	22	<0.001	1.82	22	ns

2. Age

Juvenile plumage

As usual in passerines, the juvenile body-feathers are softer and looser in texture than those of adults. Overall coloration of this plumage is duller; but the extent of geographic variation is as in the adults (see "Review of subspecies", below).

First winter plumage

The first autumn bird after post-juvenile moult is very similar to an adult in fresh plumage. The majority can be distinguished by a combination of the following characters: unmoulted juvenile remiges and rectrices have partially worn tips, while the feathers themselves are usually lighter than in adults, viz. brown (blackish or dark brown in adults); the central pair of rectrices (R1) is narrower and has the tips more sharply pointed than in adults; the light wedge on the inner vane R6 is narrower, usually greyish, not pure white; the 2nd alula feather (Al 2) is lighter, brown, normally with a pale ochraceous fringe on the outer vane and top (in adult, dark brown with an ash-grey fringe).

First summer plumage

Some of the above-mentioned characters, especially the coloration of remiges and rectrices, R6 and Al 2, are still diagnostic in worn spring-summer plumage as well, up to and including July.

Adults in winter and summer plumages

The most significant diagnostical characters to separate adults from first year birds are listed above.

3. Review of subspecies

The detailed examination of the type series of *S. c. jaxartica* Snigirewski, 1929 showed that it is a mixed one and consists of birds of different subspecies: *S. c. blythi* (one migrant bird), *S. c. minula* (two migrants) and *S. c. halimodendri* (13 local breeders from the lower Syrdar'ya River valley, including the holotype of *S. c. jaxartica*). Thus, the name *S. c. jaxartica* is a junior synonym of *S. c. halimodendri* Sushkin, 1904. The results of our revision demonstrate also that Kazakhstan, the Altai, and Middle and Central Asia include the breeding range of five subspecies: *halimodendri, telengitica, snigirewskii, minula* and *margelanica*. All differ from the three northern and western subspecies *curruca, blythi* and *caucasica* in the lighter colouration of their upperparts. The five Asian light-coloured subspecies can be diagnosed as follows:

Sylvia curruca halimodendri Sushkin, 1904 – Kazakhstanian Lesser Whitethroat

Synonym: *Sylvia curruca jaxartica* Snigirewski, 1929.

In spring-summer plumage, differs from the northern *S. c. curruca* and *S. c. blythi* in a pure grey crown and nape (less brown), and a much lighter mantle, which is grey with slight yellowish tint. The wing and bill are somewhat shorter (tables 2 & 3) and the wing blunter than in *S. c. curruca*: the tip of P2 is situated near the tip of P6 in 11.1% only (out of 63 birds), near tip of P7 in 79.4%, and near tip of P8 in 9.5%.

Distribution. Breeds from the mouth of the Volga River and the N.E. shore of the Caspian Sea east over Kazakhstan to the Zaisan Depression, Tarbagatay Mts and N.W. China (Dzhungaria, N. Xinjiang). The northern boundary approximately coincides with that of semi-deserts, the eastern boundary is formed by the western foothills of the Mongolian Altai and the northern foothills of the Tien Shan Mts. Southward this subspecies reaches to the Mangyshlak Plateau, the lower Amudar'ya River and the central part of the Kyzylkum Desert. At its northern boundary it intergrades with *S. c. curruca* and *S. c. blythi* and in the south with *S. c. snigirewskii*, while in the east (in southern Dzhungaria) specimens morphologically intermediate with *S. c. minula* have been collected.

Sylvia curruca telengitica Sushkin, 1925 – Telengitian Lesser Whitethroat

This subspecies is larger (in wing, tail and tarsus) than others, except for *S. c. margelanica* from which it differs by a longer bill (table 2 & 3). It can also easily be distinguished by colouration: the upperparts are lighter than in *S. c. curruca* and *S. c. blythi*, but darker than in other Asiatic forms, including *S. c. halimodendri*. As compared with the latter, the mantle of *S. c. telengitica* is not only darker in all plumages, but also more greyish, without a yellowish tint in summer; upper tail-coverts and R1 are greyer as well. The wing is more pointed than in *S. c. halimodendri*: the tip of P2 is situated near the tip of P5 in 6.7% out of 30 birds, near the tip of P6 in 66.7%, and near the tip of P7 in 26.6% only. So, this subspecies is morphologically rather well distinguishable, and there are no grounds to treat it as just a synonym of *S. c. halimodendri* (contra Shirihai et al., 2001).

Distribution. Mainly a mountain bird, its breeding area is confined to the S.E. Russian Altai, the Tannu-Ola Mts and W. Mongolia. Northward it reaches to the Chuya steppe and the southern foothills of the Tannu-Ola, southward approximately to 45ºN in the Gobi-Altai, eastward to approximately 96ºE in the western Hangay Mts (Hangayn Nuruu) of Mongolia. To the east, there is a wide zone of intergradation with *S. c. blythi* in the Mongolian Hangay and the Hövsgol area between 96° and 101°E (*blythi* nests further east in Mongolia). Numerous specimens with intermediate phenotypes have been collected in this zone. However, five specimens examined from the Gobi Altai Mts are intermediate in size and colouration between *S. c. telengitica* and *S. c. halimodendri*.

Sylvia curruca snigirewskii Stachanow, 1929 – Turkmenian Lesser Whitethroat

New name for *Sylvia curruca turkmenica* Snigirewski, 1927, preoccupied by *Sylvia mystacea turcmenica* Zarudny & Bilkevich, 1918.

This subspecies is closest to *S. c. halimodendri* in size (see table 2 & 3), but its mantle is noticeably lighter and greyer. It is similar to *S. c. telengitica* by showing a reduced amount of yellow or ochre tint on the upperparts and flanks (this yellow or ochre is characteristic for *S. c. halimodendri* and, especially, for *S. c. minula* and *S. c. margelanica*). However, the

Table 2. Summary statistics ($\bar{x}$ ± SD, n, range) for measurements (in mm) of males of the various subspecies of *Sylvia curruca*.

	Taxon				
Variable	*S. c. halimodendri*	*S. c. snigirewskii*	*S. c. telengitica*	*S. c. minula*	*S. c. margelanica*
Wing length (P3=P4)	63.58 ± 1.34, 56	63.41 ± 1.37, 31	67.94 ± 1.29, 25	61.38 ± 1.27, 92	68.82 ± 1.37, 27
	60.1 – 66.2	60.6 – 65.9	66.0 – 70.6	58.2 – 64.4	66.7 – 70.9
Tail length	57.12 ± 1.67, 58	57.78 ± 1.89, 31	60.36 ± 1.36, 25	54.28 ± 1.52, 92	60.81 ± 1.95, 27
	53.3 – 60.6	54.3 – 61.7	57.6 – 63.1	50.4 – 57.6	56.6 – 64.1
Tarsus length	19.48 ± 0.56, 59	19.33 ± 0.54, 22	20.76 ± 0.59, 25	19.12 ± 0.49, 92	20.49 ± 0.72, 28
	18.1 –20.8	18.2 – 20.3	19.6 – 21.9	17.5 – 20.0	19.1 – 22.2
Culmen from feathers	8.27 ± 0.34, 55	8.24 ± 0.49, 22	8.70 ± 0.43, 22	7.43 ± 0.35, 78	8.03 ± 0.40, 27
	7.3 – 8.9	7.3 – 9.2	8.0 – 9.8	6.6 – 8.3	7.3 – 8.8
Culmen from nares	6.66 ± 0.25, 55	6.66 ± 0.33, 22	7.11 ± 0.36, 22	6.23 ± 0.25, 90	6.50 ± 0.24, 27
	5.8 – 7.3	6.1 – 7.2	6.4 – 7.7	5.5 – 6.8	6.0 – 7.1
Bill width at nares	2.59 ± 0.15, 58	2.41 ± 0.23, 22	2.68 ± 0.18, 25	2.45 ± 0.12, 80	2.65 ± 0.13, 26
	2.2 – 2.9	2.1 – 2.8	2.4 – 3.1	2.2 – 2.7	2.3 – 2.9
Bill depth at nares	2.77 ± 0.12, 58	2.68 ± 0.11, 21	2.84 ± 0.14, 25	2.57 ± 0.10, 86	2.81 ± 0.11, 26
	2.4 – 3.0	2.4 – 2.8	2.6 – 3.1	2.2 – 2.8	2.6 – 3.0
P1 length	31.72 ± 1.47, 55	31.01 ± 1.99, 21	33.04 ± 1.44, 24	30.51 ± 1.44, 75	33.34 ± 1.67, 27
	28.6 – 34.3	26.8 – 34.9	30.7 – 36.3	27.1 – 33.8	29.8 – 36.2
P2 length	58.91 ± 1.56, 54	58.60 ± 1.59, 21	63.65 ± 1.28, 22	56.50 ± 1.43, 75	63.89 ± 1.43, 26
	55.5 – 61.7	56.1 – 62.7	61.4 – 66.0	52.6 – 59.7	60.9 – 66.4
P5 length	63.08 ± 1.52, 54	62.83 ± 1.49, 21	67.12 ± 1.22, 13	60.71 ± 1.39, 75	67.60 ± 1.54, 24
	59.5 – 66.2	58.8 – 65.2	65.3 – 69.8	57.4 – 63.1	64.9 – 70.1
P6 length	61.10 ± 1.41, 54	61.18 ± 1.41, 20	64.72 ± 1.20, 22	59.50 ± 1.32, 75	65.44 ± 1.41, 26
	58.5 – 63.7	59.1 – 63.8	62.7 – 66.9	56.7 – 62.8	62.6 – 68.1
P7 length	58.44 ± 1.38, 54	58.53 ± 1.31, 19	61.93 ± 1.10, 21	56.83 ± 1.29, 75	61.98 ± 2.03, 27
	55.7 – 61.6	56.3 – 60.8	59.6 – 64.6	53.7 – 60.1	54.3 – 64.2
P10 length	52.94 ± 1.30, 46	52.98 ± 1.27, 13	56.23 ± 0.99, 23	51.69 ± 1.10, 75	56.04 ± 1.19, 27
	50.6 – 55.8	51.1 – 56.1	54.3 – 57.6	49.7 – 55.4	52.8 – 58.0
S1 length	51.18 ± 1.07, 56	51.28 ± 1.35, 21	54.09 ± 1.05, 24	49.97 ± 1.10, 78	53.88 ± 1.24, 27
	49.3 – 54.1	49.2 – 54.1	51.7 – 55.8	46.8 – 52.4	51.1 – 55.8

Table 3. Summary statistics ($\bar{x}$ ± SD, n, range) for measurements (in mm) of females of the various subspecies of *Sylvia curruca*.

	Taxon				
Variable	*S. c. halimodendri*	*S. c. snigirewskii*	*S. c. telengitica*	*S. c. minula*	*S. c. margelanica*
Wing length (P3=P4)	63.08 ± 1.62, 15	61.28 ± 0.98, 13	66.18 ± 1.92, 11	60.74 ± 1.41, 30	66.32 ± 1.20, 12
	60.2 – 65.6	59.7 – 62.9	63.1 – 68.8	58.2 – 63.2	64.1 – 68.4
Tail length	56.65 ± 1.81, 15	55.85 ± 2.12, 13	59.06 ± 2.25, 11	54.47 ± 1.57, 30	58.86 ± 1.11, 12
	52.8 – 59.8	52.3 – 59.3	55.3 – 62.6	51.1 – 57.7	57.1 – 61.1
Tarsus length	19.67 ± 0.49, 15	18.94 ± 0.71, 11	20.44 ± 0.73, 11	19.09 ± 0.50, 30	20.58 ± 0.77, 12
	19.0 –20.8	18.3 – 20.4	19.6 – 22.1	18.1 – 19.8	19.3 – 21.7
Culmen from feathers	7.69 ± 0.26, 15	8.26 ± 0.39, 11	8.73 ± 0.57, 10	7.27 ± 0.33, 24	8.19 ± 0.32, 12
	7.3 – 8.1	7.6 – 8.9	7.6 – 9.6	6.6 – 8.1	7.6 – 8.8
Culmen from nares	6.51 ± 0.18, 15	6.57 ± 0.30, 11	7.06 ± 0.46, 10	6.20 ± 0.22, 30	6.70± 0.32, 12
	6.2 – 6.7	6.1 – 7.1	6.1 – 7.6	5.7 – 6.7	6.3 – 7.3
Bill width at nares	2.61 ± 0.09, 14	2.47 ± 0.19, 11	2.64 ± 0.13, 11	2.47 ± 0.14, 24	2.62 ± 0.26, 12
	2.5 – 2.8	2.2 – 2.8	2.4 – 2.8	2.2 – 2.8	2.1 – 2.9
Bill depth at nares	2.69 ± 0.09, 13	2.69 ± 0.11, 11	2.88 ± 0.12, 11	2.59 ± 0.12, 27	2.85 ± 0.11, 12
	2.6 – 2.9	2.5 – 2.9	2.7 – 3.0	2.4 – 2.8	2.6 – 3.0
P1 length	32.01 ± 1.30, 15	31.39 ± 1.29, 7	32.93 ± 2.02, 11	30.38 ± 1.18, 23	32.12 ± 1.86, 12
	30.1 – 34.3	29.4 – 32.8	29.9 – 37.1	28.6 – 32.3	29.2 – 34.7
P2 length	58.42 ± 1.89, 15	56.96 ± 0.40, 7	61.69 ± 2.25, 11	56.04 ± 1.71, 22	61.82 ± 1.59, 12
	55.1 – 61.9	56.4 – 57.6	58.6 – 65.1	52.5 – 58.6	57.7 – 63.4
P5 length	62.64 ± 1.65, 15	60.46 ± 1.00, 7	66.03 ± 1.72, 7	59.81 ± 1.69, 21	65.22± 1.40, 10
	60.1 – 64.4	59.5 – 62.0	63.0 – 67.9	57.4 – 62.1	63.4 – 68.1
P6 length	60.71 ± 1.51, 14	58.46 ± 1.08, 7	62.96 ± 1.98, 11	59.16 ± 1.43, 21	62.71 ± 1.68, 12
	57.9 – 63.2	56.8 – 60.3	60.3 – 66.2	56.5 – 61.3	60.6 – 66.4
P7 length	58.20 ± 1.26, 14	56.14 ± 1.08, 7	60.19 ± 1.78, 11	56.36 ± 1.57, 21	59.54 ± 1.42, 12
	56.2 – 60.1	54.5 – 57.6	57.6 – 63.3	53.3 – 58.6	57.7 – 62.8
P10 length	52.81 ± 1.16, 15	51.71 ±1.15, 7	54.92 ± 1.91, 11	51.43 ±1.39, 21	54.14 ± 1.36, 11
	50.1 – 54.9	50.1 – 53.1	52.6 – 58.9	48.3 – 53.7	52.3 – 56.4
S1 length	50.51 ± 1.12, 15	50.19 ± 1.14, 7	52.82 ± 1.94, 11	49.56 ± 1.27, 22	52.07 ± 1.15, 12
	47.6 – 51.9	48.4 – 51.4	50.8 – 57.6	46.9 – 51.9	50.6 – 54.2

grey colour on the mantle is much purer and lighter than in *S. c. telengitica.* The wing shape is also close to that of *S. c. halimodendri*: out of 26 birds, the tip of P2 is situated mainly near the tip of P7 (73.1%), in the remainder (26.9%) it is near the tip of P6.

Distribution. A typical dweller of the southern sandy deserts of Transcaspian region, mainly Karakum Desert; we have no exact data on the distribution on both sides of the Iran-Afghanistan boundary (Roselaar in Shirihai et al., 2001: 143). Near its northern boundary (which is approximately at 42ºN) it intergrades with *S. c. halimodendri*.

Sylvia curruca minula Hume, 1873 – Kashgarian Lesser Whitethroat

The smallest bird (see table 2 & 3); upperparts very light, as in *S. c. snigirewskii*, but with an ochre tint, especially intensive in winter plumage; the ochre colour is well developed on the flanks as well. The wing tip is the most rounded of all forms: out of 114 birds, the tip of P2 is situated near the tip of P6 in one specimen only, near P7 in 71.9%, and near P8 in 27.2%.

Distribution. Nests mainly in the Tarim Basin (S Xinjiang, China). The northern boundary of the breeding range is formed by the southern foothills of the Tien Shan, the western one by the eastern foothills of the Pamir-Alai ranges, the southern one by the foothills of the W Kun Lun and Altun Shan Mts. In the east it reaches the Lop Nur Depression. A rather common opinion that *S. c. minula* nests in Middle Asia is erroneous; it is only registered there during spring and autumn migration. Birds intermediate in phenotype with *S. c. halimodendri* have been collected near the northern border of the Tarim Basin.

Sylvia curruca margelanica Stolzmann, 1897 – Alashanian Lesser Whitethroat

Synonym: *Sylvia curruca chuancheica* Portenko, 1929.

A large form, close in size to *S. c. telengitica*, except for a shorter bill (tables 2 & 3). Very similar to *S. c. minula* in colouration, but the upperparts are somewhat darker in all plumages and the mantle is slightly greyer in summer. As the bird is a long-distance migrant, the wing is relatively pointed: the tip of P2 is situated near the tip of P6 in 59.0% out of 39 birds, and near the tip of P7 in the remaining 41.0%.

Distribution. Nesting birds have been examined from China, mainly from the mountains of E Qinghai, Gansu and Ningxia, especially the Alashan (= Helan Shan). The known range extends from the Beishan Mts (NW Gansu) east to the Ulashan Mt. (= Muni Ula Mt., west of Baotou, in central Inner Mongolia at 40º31′N, 110º08′E) and south to the vicinity of Guy Duy (= Guide, E Qinghai at 35º59′N, 101º24′E) in the valley of upper Huang He River. Additional data are necessary to confirm the suggested breeding in the Kaxtax Shan (in the Kun Lun Mts on the northern fringe of the Tibetan Plateau) (Loskot, 2001b).

The Qaidam basin is populated by birds similar to *S. c. margelanica* in colouration, but intermediate with *S. c. minula* in size: in eight males, the length (mm) of the wing is 65.17 ± 1.27 (63.4-66.9), tail 57.87 ± 1.62 (55.9-60.2), tarsus 19.89 ± 0.45 (19.3-20.3), culmen from feathers 7.55 ± 0.42 (7.1-8.2), and culmen from nares 6.36 ± 0.24 (6.1-6.8). The existence of this phenotypically intermediate population contradicts the conclusion that *minula* has reached species status (contra Shirihai et al., 2001).

To conclude, the results of our analysis of morphological variation in the southeastern forms of *S. curruca* support the validity of five light-coloured subspecies: *hali-*

modendri, *telengitica*, *snigirewskii*, *minula* and *margelanica*. These subspecies are connected by intergradation zones from which numerous phenotypically intermediate birds were examined. The subspecies *halimodendri* and *telengitica* show similar intergradation zones with the two northern dark-coloured forms *S. c. curruca* and *S. c. blythi*, a reason to conclude that all forms belong to a single species, and not to three species as in Shirihai et al. (2001).

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