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Taxonomy of the *Phylloscopus proregulus* complex

by Per Alström & Urban Olsson

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Pallas's Warbler *Phylloscopus proregulus* is usually divided into 3 subspecies:

(1) *proregulus* (Pallas) breeding in Siberia, northern Mongolia and northeastern China (Manchuria), and wintering mainly in southeastern China;
(2) *chloronotus* (Gray) breeding in central China and in the Himalayas west to central Nepal, where it intergrades with
(3) *simlaensis* Ticehurst, which occurs in the western Himalayas. The latter 2 are mainly altitudinal migrants (see Ali & Ripley 1973, Cheng 1987, Harrison 1982, Mayr & Cottrell 1986, Ticehurst 1938, Williamson 1967; Fig. 1).

Another form, *kansuensis* Meise (northern Gansu Province, China), has been described, but was regarded by Vaurie (1954) as synonymous with *proregulus*; Mayr & Cottrell (1986) follow Vaurie in this respect. Cheng (1987), on the other hand, treats it as a synonym of *chloronotus*. Judging from the only specimen of this form that we have seen (at the British Museum (Natural History) (BMNH), Tring; BM No. 1938.5.16.21), we agree with Cheng that it is best synonymised with *chloronotus*; Peter Colston (BMNH), who has also studied this specimen, agrees.

Cheng and Mayr & Cottrell state that *proregulus* intergrades with *chloronotus* in the eastern part of Qinghai Province, China, a statement for which we have found no support. Accordingly, we believe that the breeding range of nominate *proregulus* is geographically well separated from *chloronotus*/*simlaensis* (Fig. 1).

We have studied all 3 forms on their respective breeding grounds: *proregulus* in Siberia in 1984 and 1986 and in Manchuria in 1987 and 1988;

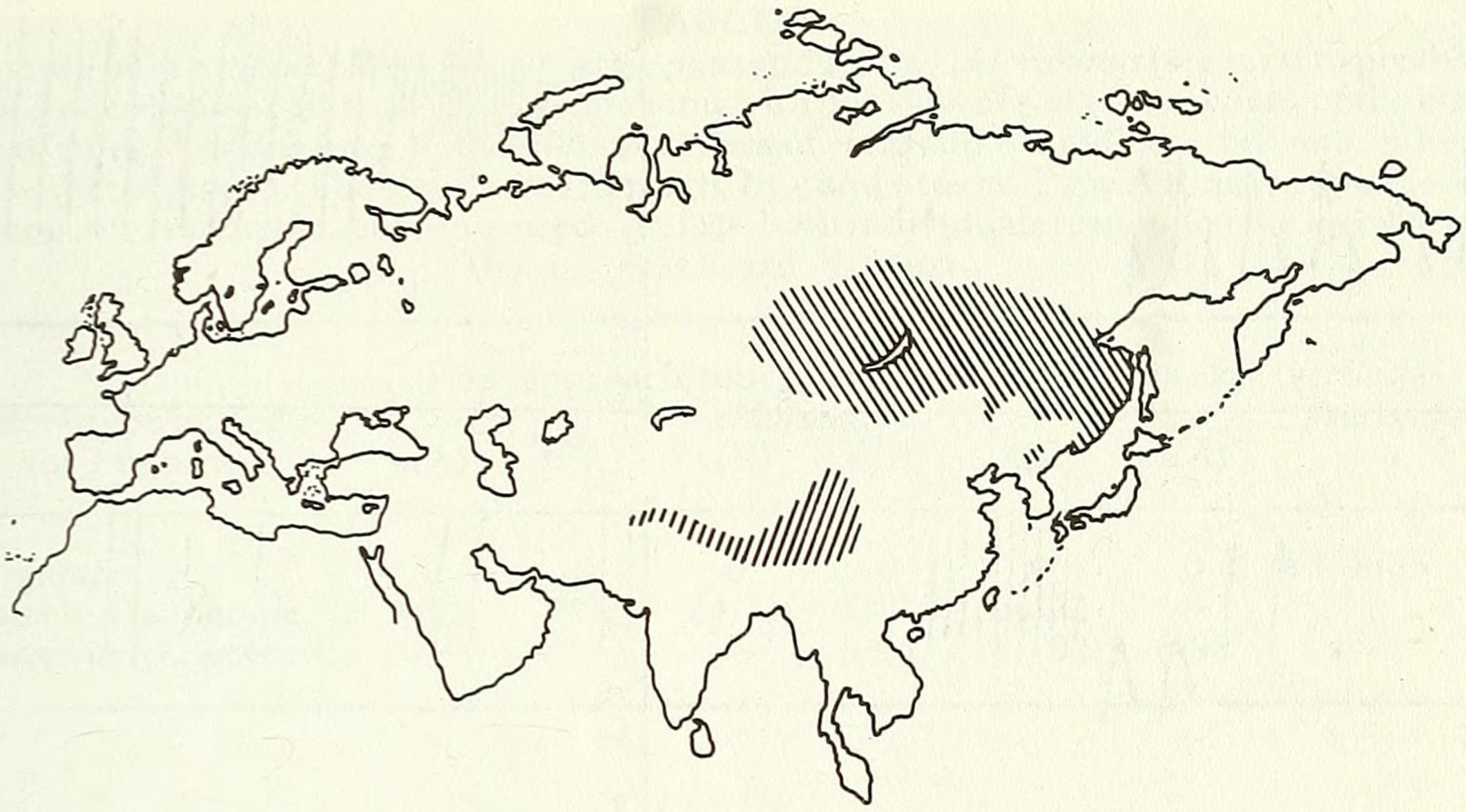

Figure 1. Distribution of (nominate) *Phylloscopus proregulus* \\\\ and *P. (p.) chloronotus* (see text) (including *simlaensis*) ////. Based on Cheng (1987), Harrison (1982) and personal experience.

chloronotus in Nepal in 1983 and in China in 1986, 1987 and 1989; and *simlaensis* in Kashmir in 1983. We are subsequently of the opinion that *P. proregulus* (*sensu lato*) should be divided into 2 species, *P. proregulus* (monotypic) and *P. chloronotus* (with subspecies *chloronotus* and *simlaensis*). Alström, Colston & Olsson (1990) indicate the likelihood of a new species, which has possibly been overlooked because of its close similarity to sympatric *chloronotus*.

Morphological differences between *proregulus* and *chloronotus/simlaensis*

Morphologically, *proregulus* and *chloronotus/simlaensis* are extremely similar. In fresh plumage, the supercilium and median crown-stripe and often also the ear-coverts, chin, throat and wing-bars are much more yellow in *proregulus*. Especially in front of and above the eye, the supercilium is generally bright yellow in *proregulus*, while it is very pale yellowish, generally looking off-white or pale buffish, in *chloronotus/simlaensis*. The supercilium also tends to be slightly broader in front of the eye in *proregulus*. Moreover, *proregulus* is slightly greener, less brownish-tinged, on the mantle when fresh, especially compared to *chloronotus*, which is also darker. In fresh plumage, *simlaensis* is more buffish below than the other 2 forms. In worn plumage the differences in colouration between the 3 forms are less obvious.

There are only slight on-average differences in the wing-formula; *proregulus* has marginally shorter 10th primary 5.5–9.0 mm > primary coverts, as opposed to 6–12.5 mm in *chloronotus/simlaensis*; in *proregulus* the 9th falls between 2nd and 4th, but in *chloronotus/simlaensis* between the tips of the secondaries and the 3rd primary, most often between the 1st and 2nd primaries (primaries numbered descendantly) (Williamson 1967 and personal measurements).

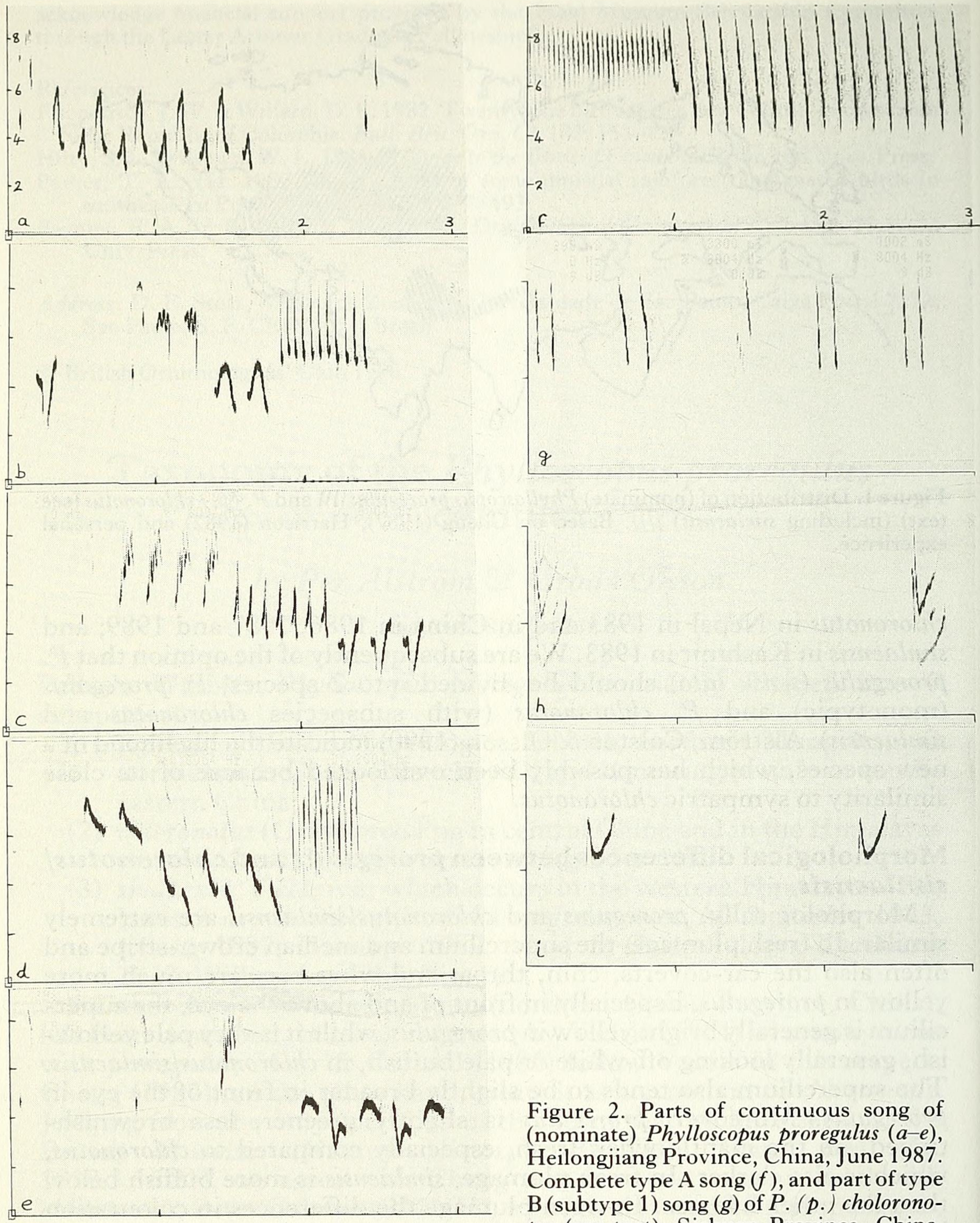

Figure 2. Parts of continuous song of (nominate) *Phylloscopus proregulus* (*a–e*), Heilongjiang Province, China, June 1987. Complete type A song (*f*), and part of type B (subtype 1) song (*g*) of *P. (p.) cholorono-tus* (see text), Sichuan Province, China, May 1987. Call of *proregulus* (*h*), Heilong-jiang Province, China, June 1988. Call of *chloronotus* (*i*), Sichuan Province, China, May 1989.

All tape recordings by Per Alström; sonograms made by Richard Ranft, British Library of Wildlife Sounds. Band width 369 Hz. Horizontal scale gives time in seconds; vertical scale gives KHz 0–8.

TABLE 1

Response of (nominate) *Phylloscopus proregulus* and *P. (p.) chloronotus* (see text) to playback of song of each other and of *P. (p.) chloronotus* with one type of song to playback of the other type of song. A and B refer to the different types of song and a–f indicate different individuals. — = not played. The slow 'first approach' by c and e to the Type A song is explained by the long intervals in the recording used—in fact, both individuals responded the second time the song was heard. See text.

	First approach/time spent within 5 m of speaker (seconds)						
			chloronotus				*proregulus*
Songtype played for 2 minutes	a(A)	b(A)	c(B)	d(B)	e(B)	f(A)	g
proregulus	0	0	0	0	0	0	8/85
chloronotus (songtype A)	5/95	7/92	24/71	5/113	24/72	—	
chloronotus (songtype B)	—	—	—	6/96	8/102	6/98	

Vocal differences between *proregulus* and *chloronotus/simlaensis*

The song of *proregulus* is very loud, rich and varied, consisting of clear whistles and trills—somewhat reminiscent of the song of the Canary *Serinus canaria* (Figs 2a–e).

chloronotus/simlaensis has at least 2 different basic types of song. One type (A) is a drawn-out thin rattle immediately followed by a rapid series of hammering notes of the same pitch (Fig. 2f). It can be transcribed "*tsirrrrrrrrrrr-tsi-tsi-tsi-tsi-tsi-tsi-tsi-tsi-tsi-tsi-tsi-tsi-tsi-tsi-tsi-tsi-tsi-tsi*". The duration is only 3–4 seconds, and it is repeated at intervals of 5–10 seconds or more. The second type (B), which is somewhat variable, is (1) a stuttering, 'endless' series of notes of alternating pitch, e.g. "*tsi tsi-tsi tsi-tsi tsü-tsü tsi-tsi tsü-tsü tsi-tsi tsi-tsi tsi-tsi tsi-tsi tsirrp tsi-tsi tsü-tsü tsü-tsü tsi-tsi tsü-tsü-tsü . . .*" (Fig. 2g); or (2) "*tsi-tsi tsi-tsi tsü-tsü tsi-tsi tsü tsi-tsi tsidididididididi tsi-tsi tsü-tsü tsi tsü-tsü-tsü tsi-tsi tsi-tsi tsi-tsi-tsi-tsi-tsi-tsi-tsi-tsi-tsi . . .*", or similar. Sometimes a rattling "'*tsirrrrrrr*" is admixed in both forms. Another variant on this theme is (3) "*tsi-tsi-tsi-tsi-tsi-tsi-tsi-tsi-tsi . . . tsi-tsi . . . tsitsi-tsi-tsi-tsi-tsi-tsi-tsi-tsi . . . tsitsitsitsitsi . . . tsi-tsi. . .*". Type A has been recorded throughout the range. Of type B, (1) is the most common 'subtype' heard in China, (2) can also be heard in China but is perhaps more frequent in the western Himalayas (tape recorded by John Eames in Pakistan), and (3) has been tape recorded by Steve Madge in Darjeeling, India. Sonograms of *chloronotus*, which appear to be variants of type B, are found in Martens (1980).

Our observations of *chloronotus* in China showed that one individual male usually sings only one of the 2 types. In fact, although we strongly suspect that any male is capable of singing both types, we have no firm proof of this. However, males singing the type A song respond as vigorously to a playback of type B as to its own song and *vice versa* (Table 1).

The call of *proregulus* (Fig. 2h) is a rather faint, soft, slightly nasal "*dju-ee*" or, differently transcribed "*duee*". The call of *chloronotus/simlaensis* is very different, a high-pitched "*uist*" (Fig. 2i).

Playback experiments

In 1987 and 1989 we carried out a series of playback experiments in China in order to test the reactions of *chloronotus* to the song of *proregulus* and *vice versa*. Unfortunately, *proregulus* proved to be exceptionally difficult to test; only one out of some 10 singing males responded to *proregulus* song. The reason for this is *perhaps* that we were unable to elevate the speaker to anywhere near the height at which the birds were perched when singing—generally in the tops of 20–30 m high conifers.

A powerful speaker was placed 1–2 m above the ground below a tree where a territory-holding male was singing. The tape recorder was operated and the bird watched by P.A. from 10 m away from the speaker and by U.O. from approximately 25 m away. Care was taken so that P.A., who was nearer to the speaker, would not be easily seen by the bird. The tape was not played until the bird was clearly visible.

Four *chloronotus* (designated a–d), 2 at Lijiang, Yunnan Province (c. 27.5°N, 100.5°E) on 4 April 1987 and 2 on Emei Shan, Sichuan Province (29°31′N, 103°20′E) on 18 May 1987 and 10 May 1989 respectively were tested in the following way:—

(1) *proregulus* song was played for 2 minutes.
(2) This was followed by *chloronotus* song, played also for 2 minutes. The 2 males at Lijiang both sang a type A song and were exposed to this type. The individuals on Emei Shan both sang type B. To the one in 1987 type A was played, and to the one in 1989 both types were played.
(3) Immediately after *chloronotus* song, *proregulus* song was played for another 2 minutes.

A different *chloronotus* (e) with type B song on Emei Shan was tested on 14 May 1987 as follows:—

(1) First *chloronotus* type B song was played for 2 minutes.
(2) Then *chloronotus* type A was played for 2 minutes,
(3) immediately followed by *proregulus* for 2 minutes.

A further *chloronotus* (f) with type A song on Emei Shan was tested on 15 May 1987 in the following way:—

(1) *chloronotus* type B was played for 2 minutes,
(2) immediately followed by *proregulus* for 2 minutes.

One *proregulus* (g) on Changbai Shan, Jilin Province (c. 42°N, 127°E) in June 1987 was tested as follows:—

(1) *chloronotus* type B was played for 2 minutes.
(2) This was followed by *proregulus* song for 2 minutes,
(3) which in turn was immediately followed by *chloronotus* for 2 minutes, and
(4) finally another round of *proregulus*.

Results

None of the 6 *chloronotus* (a–f) showed any response at all to the song of *proregulus*, whereas they all showed strong aggressive behaviour towards the song of *chloronotus*—vigorously searching for the aggressor, flying back and forth over the speaker, usually calling frequently and occasionally singing. The single *proregulus* (g) did not respond to the

song of *chloronotus*, but very strongly to the song of its own form. (See Table 1.)

Conclusion

The morphological differences between *proregulus* and *chloronotus/simlaensis* do not in themselves warrant separating them from each other. However, the very marked differences in both song and calls would seem to act as reproductively isolating mechanisms if there was any sympatry. This assumption is strongly supported by playback experiments, although a longer series of tests on *proregulus* is desirable.

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Description of a possible new species of leaf warbler of the genus *Phylloscopus* from China

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Field

On 16–17 April 1986 on Emei Shan, Sichuan Province (29°31′N, 103°20′E), U.O. noted one individual of a *Phylloscopus* warbler with a peculiar song, which reminded him of the song of *Prinia criniger*. The bird was only seen well very briefly, but it appeared to be *P. (proregulus) chloronotus*—with a previously unrecorded type of song (see Alström & Olsson 1990).