Oriental Cuckoo in Finland

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In Finland, the first birds to be identified as Oriental Cuckoo were at Lieksa (easternmost part of central Finland) and Karstula (west-central Finland), in June 1998 (Koukila 1998, Lappi 1998, Lindroos *et al.* 1999, Vasamies 1998). The next year both birds returned and a third individual was recorded in Joutsa (south-central Finland) (Lindroos *et al.* 2000). In 2000 and 2001 the old territory at Lieksa was still occupied, but in 2002 this was no longer the case. All of the birds were singing males. Little by little, it became evident that there was something strange in the songs. As early as the first contact with the Karstula bird, the original finder of the bird called attention to the fact that the call was tri-syllabic while the literature mostly described bi-syllabic songs (Koukila 1998). In the same year, at Lieksa, it was noted that the bird sometimes used a tri-syllabic song (Lappi 1998). In Lieksa, some observers noted that the second syllable was of slightly higher frequency and sometimes slightly shrill. From a distance, all the birds were very much what was expected of Oriental Cuckoo but close up, oddities became apparent.

Species, subspecies and distribution

According to Cramp (1985) the nominate Oriental Cuckoo *Cuculus saturatus saturatus* is a medium to short distance migrant, which breeds in Pakistan, Kashmir, the Himalayas and Southern China, two subspecies are tropical residents and the northern long-distance migrant is called *horsfieldi*. According to Robert Payne (*in litt.* and *in prep.*), and Higgins (1999) the valid name for *horsfieldi* is *optatus* (Gould 1845), as an older synonym. *Optatus* also occurs in Europe, where the normal distribution area continues west into the northern boreal zone as far as the mouth of the river Vychegda, that is, approximately to the western border of the Komi Republic (Hagemeijer *et al.* 1997). From 11 to 16 June 2002, Annika Forsten, Antero Lindholm and Visa Rauste observed 22 singing Oriental Cuckoos (and 126 Eurasian Cuckoos *Cuculus canorus*) near the Komi capital, Syktyvkar. The species seemed to be more numerous in the east, near Ust-Kulom, but we even recorded them west of Syktyvkar. In the eastern parts of Komi, near the Ural Mountains, Oriental Cuckoo is more numerous (Aalto 2002. Hagemeijer *et al.* 1997, Vuolanto 1999), but even in Siberia, it continues to be generally less numerous than Eurasian Cuckoo (Rogacheva 1992), and only locally more common (Dement'ev *et al* 1966). On the Asian side, the distribution continues as a broad zone through the Siberian boreal forests to the Pacific shores, Sakhalin I, Kuril Is, Japan and China southwards to the region of the River Yangtze (Cramp 1985, Dement'ev *et al* 1966, Hagemeijer *et al* 1997). The relative distribution of *optatus* and *saturatus* in China is poorly known and the above information seems to be partly erroneous (pers. obs.) Payne (1997) splits Oriental Cuckoo into two species: Horsfield's Cuckoo *Cuculus horsfieldi* (=*optatus*) and Himalayan Cuckoo *Cuculus saturatus*. The most important argument for splitting *optatus* is the different courtship call.

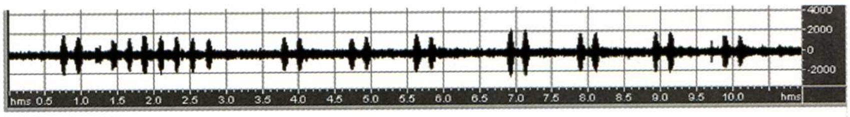

Figure 1 Oriental Cuckoo *Cuculus optatus* song sequence. The soft phrase consists of ten syllables in this case. The basic rhythm phrases are bi-syllabic and follow each other after about one second (i.e. the period is one second). This sequence – recorded in Komi - has an irregularity between the third and fourth phrase in the basic rhythm. The basic rhythm can continue much longer than this.

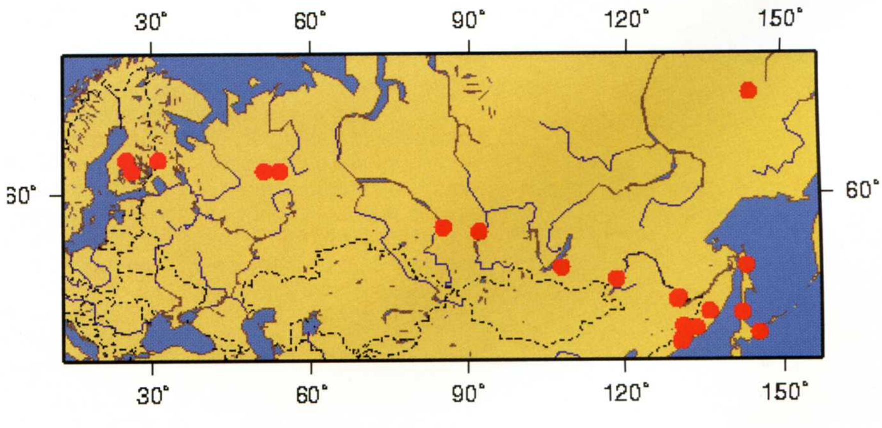

Figure 2. Recording locations.

The voice of Oriental Cuckoo

In this study, the whole advertisement call or song (*cf.* fig 1) of Oriental Cuckoo is termed "sequence". Its components ("BU-BU") are "phrases" and the components of phrases (single "BU") are called "syllables". The "period" of the song is the time interval between subsequent beginnings of phrases. "Basic rhythm" is the part of the sequence consisting of similar, repeated phrases. In some song types there is a weaker initial syllable in the phrases that is termed the "weak note".

The song of *optatus* Oriental Cuckoo is essentially a repeated series of bi-syllabic, soft, "BU"s. For example, in 1994 Visa Rauste (*in litt.*) recorded the following at Mirnoye, in the middle reaches of the river Yenisei: "At the beginning there were (almost) without exception 6-8 syllables po-po-po-po-po-po followed by 10-20 invariably bi-syllabic po-po– sounds. The rhythm was very stable. There was almost no variation in several dozen individuals heard". Descriptions of Cramp (1985), Dement'ev *et. al* (1965) and Svensson *et al* (1999) are similar. Flint *et.al.* (1984) and Knystautas (1987) describe the song with three similar notes. We think that the description by Payne (1997) actually refers to *saturatus*.

Using the data collected for this study (Siberian and European groups, *cf.* later in this study and Table 2), the basic rhythm of *optatus* Oriental Cuckoo could be described as invariably having bi-syllabic phrases. The period is on average one second, that is, the next phrase follows after one second, but there can be some irregularities. At the beginning of the sequence there is a softer and faster phrase with 4-10 syllables and sometimes these multi-syllabic phrases can occur irregularly in other parts of the sequence. This multi-syllabic part (termed "soft phrase") is almost always present but, if the pause after the preceding sequence is very short, the soft phrase can be absent. Sometimes the bird can utter several soft phrases one after another without phrases of the basic rhythm in between. The number of syllables in these sequential soft phrases may vary, but otherwise there is not much individual variation. Some birds have a harsher tone, and this same type of variation occurs in Eurasian Cuckoo. Syllables are of the same frequency, but Oriental Cuckoo tends to have the first syllable slightly higher-pitched than the second. On average, the difference in pitch is less than two Hz, so minimal that it is difficult to detect this by ear. There is often no measurable difference, or the first note can also be slightly lower-pitched. Apart from this possible minimal difference in pitch, both syllables of the song of northern Oriental Cuckoo are very similar to each other. The amplitude of the second note is, on average, lower (in 16 cases out of 62, the first note in any given resolution was stronger than the second, except for one case, which was reversed).

There seems to be no geographical variation in the song of Oriental Cuckoo from European Russia to Sakhalin Is and Kuril Is in the Pacific. In this analysis there are no samples from Japan or Korea, but we have heard some recordings from that area and they have been of the Siberian type. In China, there is another song type, attributable to nominate *saturatus*. (We are preparing a separate article on *saturatus*. Its song has three or four syllables and the first note is shorter, higher-pitched and weaker than the others.)

Eurasian Cuckoo has a bi-syllabic call. The first syllable shows a maximum energy at 620 – 710 Hz and the second at 470-550 Hz. That is, the first is clearly higher pitched than the second, and the whole call is higher pitched than that of Oriental Cuckoo. The first syllable may be slightly cracked (*cf.* fig 3 where the first part of the graph is high).

When assessing the records of Oriental Cuckoo in Finland, we have to take into account various abnormal song types of Eurasian Cuckoo. In Russian Karelia, in June 2003, Annika Forsten and Antero Lindholm heard 200 Eurasian Cuckoos of which five seemed abnormal. The commonest abnormality was cracking of the second note, almost as if the bird does not have enough power to utter the song completely. In addition, there was one bird with a very odd song, which was harsh and muted, sounding hoarse, and almost difficult to identify as a Eurasian Cuckoo. At this stage in our assessment, the bird that sang in Suomussalmi (central-northern

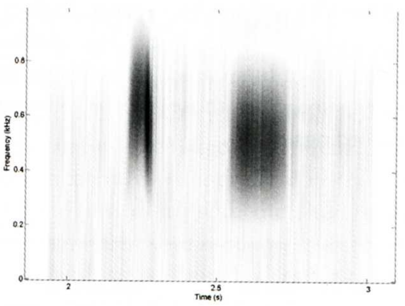

Figure 3. Eurasian Cuckoo *Cuculus canorus* song. 6.5.2002, Espoo, Finland. Two syllables which are different from each other. The first is higher-pitched and shriller. The Figures 3- 6 are drawn with Sound Ruler by Marcos Gridi Papp, spectrogram parameters, *cf.* sound measurement methods.

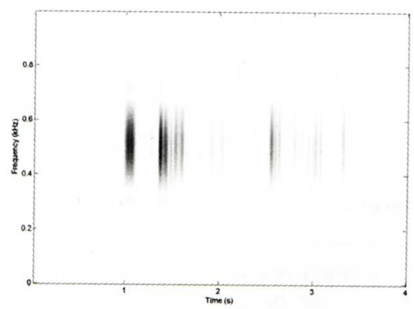

Figure 4. Very strange cuckoo song, probably Eurasian Cuckoo, June 2002, Suomussalmi, Finland. Recorded by Hannu Rönkkö. Here are two phrases, which are quite different from each other. The first note is quite Eurasian Cuckoo – like, but the second is broken, stammering, multi-syllabic.

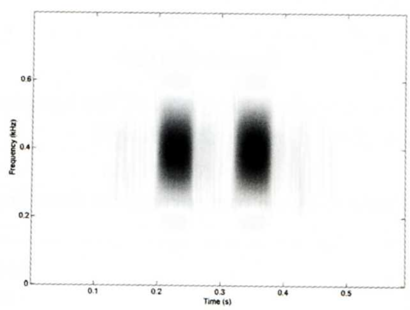

Figure 5. Oriental Cuckoo *Cuculus optatus* phrase, June 2002, Komi, Russia. The syllables are clearly lower-pitched than in Eurasian Cuckoo and very similar to each other. The difference between syllables in timing is 0.2 seconds. Most of the energy lies at about 400 Hz. This structure is little affected by individual variation. The first syllable has a slight tendency to be higher and stronger than the second, but this is often not possible to hear.

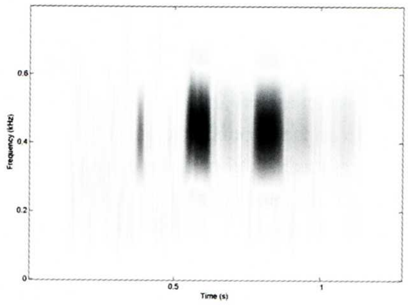

Figure 6. Unidentified Cuckoo, 6 June 2001, Lieksa, Finland. The phrases are trisyllabic, the first is a weaker and slightly lower-pitched "weak note". The second is higher-pitched than the third; the difference is easy to hear. The second syllable glides slightly downward.

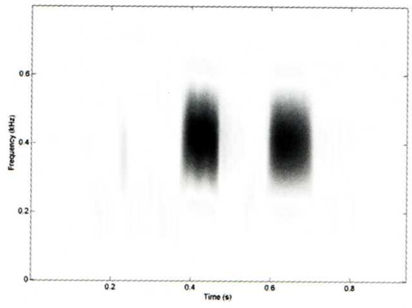

Figure 7. Unidentified Cuckoo 7 June 2000, Lieksa, Finland. The same bird as in Fig. 6, but a year earlier. Very similar call. The weak note is weaker, but still easy to hear. Recorded by Jan-Erik Bruun.

Finland) in 2002 and 2003, has to be considered a variant of Eurasian Cuckoo. Several observers thought this bird resembled Oriental Cuckoo (Fig 4).

The call of Hoopoe *Upupa epops* is quite similar to that of Oriental Cuckoo and this caveat should not be underestimated. Normally it is tri-syllabic, while the call of *optatus* is bi-syllabic. Sometimes Hoopoe has a bi-syllabic call (Cramp 1985). Hoopoe does not have anything like the soft phrase of Oriental Cuckoo in its song. The Hoopoe's call is higher-pitched and most of the energy is concentrated at 560-580 Hz area (in Oriental Cuckoo at 390-440 Hz). In the tri-syllabic phrases the initial syllable is somewhat different from the others and all syllables are slightly ascending, which makes them sound slightly inhaled.

Recordings

The recording locations of the samples are plotted on the map in fig 2.

The number of syllables in the basic rhythm phrases was counted, and the timing, frequency and amplitude differences of the syllables, and the frequency of the whole call were measured. The aim was to measure and count such properties of the recordings audible to the human ear. The spectrograms for measurements in the time axis were plotted using the CoolEdit 2000 – program. The time scale was chosen so that three phrases were visible in the spectrogram. These were chosen randomly from some point, where the bird had called its basic rhythm regularly. The resolution was chosen so that in every syllable there was a narrow band in the vertical direction that was darker than the other frequencies. For every syllable the centre of this area was marked on the x-axis and this point was chosen as describing the time of each syllable. The value was measured in hundredths of seconds. All three syllables were measured the same way and the average values were chosen as values for that individual. The frequency was measured using Sound Ruler software written by Marcos Gridi-Papp. A basic rhythm phrase was randomly chosen, the recording was sampled down to 22,050 Hz and the spectrogram was drawn using FFT size 8192. This resulted in good frequency resolution. Both notes were measured at three points: the onset of the strong part, the strongest point of the call and the end of the strong part – that means six measurements for every individual. At 400 Hz frequency, the human ear is at best, just capable of hearing a one Hz difference in pure sine wave. Using this method, the software was similarly capable of recording a one Hz difference. The difference in amplitude was measured using the second and fifth measurements.

Comparison material

The "Siberian" group includes all recordings from the Asian part of Russia, and of these, forty were provided by Olga Veprintseva, three by Christoph Zöckler (from Indigirka, Yakutia, near the town of Belaja Gora), and one is from Mild (1987). In every sample, the basic rhythm phrases are bi-syllabic.

The songs of the "European" group, consisting of twelve different Oriental Cuckoos, are from the Komi Republic, near its capital Syktyvkar on 10-16 June 2002 (recorded by A. Lindholm) which is currently the westernmost-known part of the Oriental Cuckoo's range. In every case in this group the basic rhythm phrases are bi-syllabic. All statistics are very similar to those of the Siberian recordings.

Table 1. Some measurements from the Finnish Oriental Cuckoo recordings.

Sample	Year	Period secs	Difference between notes Hz	Difference between notes secs	First main note Hz	Last note Hz
Lieksa, Hallikainen	1998	1.35	14	0.30	472	457
Lieksa, Rajasärkkä	2000	1.32	96	0.35	540	444
Lieksa, Bruun	2000	1.47	13	0.31		
Lieksa, Lindholm	2001	1.65	14	0.34	452	438
Karstula, Bruun	1998	1.53	13	0.39	450	437
Joutsa, Husa	1999	1.31	7	0.33	464	461
Joutsa, Heiskanen	1999	1.56	12	0.30	460	448

Finland

Cf. Table 1 for the measured values of the Finnish individuals.

The Lieksa bird

Four recordings were available for study. **1)** A recording by Lauri Hallikainen 28 June 1998 (published in Hallikainen 1999). The recording lasts a minute during which the bird sings 34 phrases, of which ten are clearly tri-syllabic (the rest we cannot be sure about, even using graphical presentation). The first syllable in the tri-syllabic phrases is clearly different from the others, softer, lower and lower pitched. The *saturatus* weak note comes to mind, but the first syllable of the recording (and all the other Finnish recordings) is lower in frequency than the later syllables. This sample is recorded from a considerable distance (L.Hallikainen. *pers.comm.*), and it seems possible that the weak note is just not audible in most of the phrases. Otherwise, the rhythm is very regular and the phrases with the weak note are not different from the others. The last note is slightly lower pitched than the preceding one. The recording is not a natural sequence, but put together from several pieces (L.Hallikainen. *pers. comm.*). **2)** A recording by Ari Rajasärkkä, from 24 May 2000. This is somewhat different from the other recordings. Like the others, a constantly tri-syllabic call: a short weak note, a longer and stronger middle syllable, and third note as long as the middle one, but lower pitched. The middle note is shriller and less uniform than in the other recordings (more Eurasian Cuckoo–like!). Of all recordings, this one shows the largest difference between averages of individual notes (the second and third, with the short weak note not taken into account), but the period and pause between syllables are quite typical for a recording of the claimed Finnish Oriental Cuckoos. *Cf.* Fig 9. **3)** A recording by Jan-Erik Bruun, from 7 June 2000. Quite similar to the preceding recording, the same tri-syllabic rhythm, but the second note is not similarly "broken". Cf. fig 7. **4)** A recording by Antero Lindholm from 6 June 2001. Mainly tri-syllabic phrases, a couple of bi-syllabic phrases at the beginning, but those are otherwise similar to the tri-syllabic ones. A couple of times

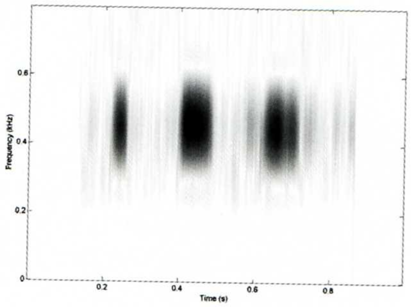

Figure 8. Unidentified Cuckoo. 28 May 1999 Joutsa, Finland. Similar to Lieksa bird. Recorded by Ilkka Heiskanen.

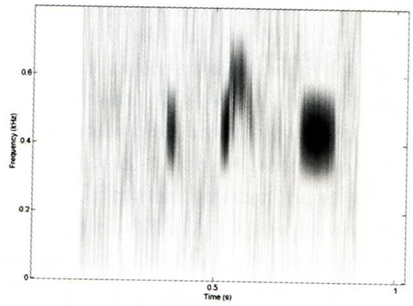

Figure 9. Unidentified Cuckoo, 27 May 2000, Lieksa, Finland. The middle syllable is different from the other Finnish recordings. Recorded by Ari Rajasärkkä.

the middle syllable is more broken than the third. Some hoarse barking caused by the excited state of the bird can be heard (this recording is on the Web *cf.* reference list, *cf.* Fig 6). There are no soft phrases in any of these recordings.

Table 2. Properties of the song. Some confidence levels: The Russian samples are different from the Finnish ones, both sample C and D. (Mann-Whitney U-test). Periods: A1 + B1 C1, P=0.005. A1 + B1 D1, P<0.001. timing: A2 + B2 C2, P=0.004. A2 + B2 D2 , P<0.001. Frequency difference: A3 + B3 C3, P=0.004. A3 + B3 D3, P<0.001. Frequency: A4+B4 C4, P=0.006. A4+B4 D4, P<0.001. A5+B5 C5, P=0.024. A5+B5 D5, P<0.001. The only difference, which is not clearly supported by data, is that in the second note frequency between the smaller Finnish sample and the Russian sample (but this is only because of the small size of the C – sample).

	Avg (Min – Max) Stdev.
A) Siberia (n=45)	
1. Period length sec.	1.07 (0.79-1.86)
2. Difference between notes sec.	0.22 (0.18-0.26)
3. Difference between notes Hz	1.89 (-7 - 11) 3.95
4. First main note Hz	402 (357-440) 18.94
5. Last note Hz	400 (354-437) 11.59
B) Komi (n=12)	
1. Period length sec.	1.09 (0.9-1.45)
2. Difference between notes sec.	0.22 (0.20-0.25)
3. Difference between notes Hz	1.44 (-10-10) 4.22
4. First main note Hz	396 (380-419) 11.01
5. Last note Hz	395 (377-417) 11.55
C) Finland (n=3)	
1. Period length sec.	1.58 (1.53 – 1.65)
2. Difference between notes sec.	0.34 (0.30-0.39)
3. Difference between notes Hz	12.83 (12-13) 0.48
4. First main note Hz	444 (422-460) 19.36
5. Last note Hz	431 (409-448) 19.85
D) Finland (n=7)	
1. Period length sec.	1.45 (1.31-1.65)
2. Difference between notes sec.	0.33 (0.30-0.39)
3. Difference between notes Hz	23.89 (4-96) 32.13
4. First main note Hz	466 (422-540) 36.36
5. Last note Hz	442 (409-461) 17.07

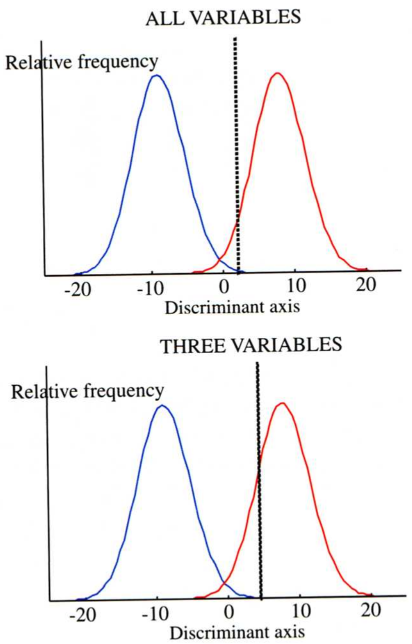

Figure 10. Eurasian Cuckoo (blue) and Oriental Cuckoo (red) relative distributions according to the model (function), with all the variables and using the reduced model. Black dashed line indicates the position of the Lieksa individual.

The Karstula bird

A recording by Jan-Erik Bruun 4 July 1998. The tri-syllabic rhythm is present and the middle syllable is higher pitched than the last, that is, very similar to the Lieksa recordings. No soft phrases.

The Joutsa bird

Two recordings were available, one by Jukka Husa, 2 June 1999 and another by Ilkka Heiskanen, 28 May 1999. Both belong to this same tri-syllabic group and lack soft phrases.

Comparison of the recordings

Some statistics are calculated in Table 2. The initial weak notes are ignored. The group (n=3) from Finland is chosen so that there is one recording from every individual (the technically-best was chosen). Group (n=7) from Finland, every available recording was used. The period length correlates strongly with the typical number of syllables, it is therefore longer in the tri-syllabic Finnish group (and nominate *saturatus*). Naturally, the period length and distance between syllables are not independent as they are measured on the same axis. Both Finnish (n=3) and (n=7) groups are statistically significantly different from the Siberian and Komi groups in most single variables. In addition, we studied two spectrograms made from the recordings in Lieksa (from 1998 by Pentti Zetterberg and 2000 by Jorma Sorjonen). These two seemed to be quite similar to other recordings. Typical for the "Finnish song type" is a slow rhythm, greater frequency difference between notes and the tri-syllabic nature. The weak note is not audible in many of the recorded phrases and it was not at all evident in many field situations. Probably there was true variation, at least in Lieksa. In addition, the first main note is somewhat descending in pitch in the Finnish recordings, so it is not of exactly the same shape as the last note.

Discriminant analysis of song parameters 'Two sample discriminant analysis' is a multivariate statistical method, in which it is possible to maximise variation between samples in relation to variation within samples. This is done by weighting every variable by some coefficient, after which, the weighted variables are summed. The discriminant function includes a constant and coefficients for every variable and operates as a formula for recognition, when, for example, the aim is to classify new observations as belonging to the first or the second group. Discriminant analysis also shows if the groups are different or not, and in what way they are different. The null hypothesis is that the mean values of the samples are the same. R^2 is the coefficient of determination of the model (0-1), F is the

Table 3 Cuckoo measurements (by A.Lindholm). Wing measured using maximum chord method, bill using callipers. Bill length to nostril (to nostril hole, not to the wall around nostril) and bill height at the proximal edge of the nostril. Some confidence levels, wing length, t-test: 1a) 5a), P=0.510 (Northern European and Siberian *canorus* cannot be separated using this sample). 1a) 6a) P<0.001 (*canorus* is larger than *optatus*). Primary barring U-test: 1d) 5d) P=0.079 (European and Siberian *canorus* not separable). 1d) 6d) P<0.001 (*optatus* has less barring than *canorus*). 10d) 11d), P<0.001 (Oriental Cuckoo has less barring than Eurasian). 1d) 2d), P=0.15 (females have more bars than males).

	a) Wing	b) Bill height	c) Bill length	d) Primary bars
1. Eurasian Cuckoo from Finland, Sweden, Norway and British Isles (*canorus*), skins, male (HZM, NHM)	225.8 (202-240) n=39	76.2 (70-84) n=42	157.6 (140-180) n=37	45.6 (41-52) n=28
2. Eurasian Cuckoo from Finland, Sweden, Norway and British Isles (*canorus*), skins, grey female (HZM, NHM)	213 (190-226) n=11	74.2 (65-80) n=10	146.0 (131-160) n=8	49.4 (44-57) n=10
3. Eurasian Cuckoo from Siberia, Mongolia and Manchuria, male (NHM), primary bar measurements (d) include live birds	227.7 (216-240) n=9	77.8 (73-81) n=8	159.9 (150-170) n=8	47.5 (37-55) n=10
4. Oriental Cuckoo from Siberia, Japan, Manchuria, Indonesia and Australia, male (*optatus*), (NHM), primary bar measurements (d) include live birds	208.8 (202-216) n=10	80.6 (77-85) n=10	165.8 (151-180) n=10	35.5 (29-43) n=14
5. Oriental Cuckoos, migrants, Eastern China, male (*optatus*), live birds	204.5 (197-211) n=4	68.6 (66-72) n=4	156.5 (152-160) n=4	
6. Oriental Cuckoos Siberia, Japan, Manchuria, Indonesia and Australia, female (*optatus*), (NHM), primary bar measurements (d) include live birds	199.5 (194-212) n=6	73.2 (68-80) n=6	162 (142-180) n=5	37.3 (24-42) n=7
7. All Eurasian Cuckoos				47.61 (35-59) n=62
8. All Oriental Cuckoos				35.32 (24-43) n=38

Figure 11. Unidentified cuckoo, male, 6 June 2001 Lieksa, Finland. The foremost underwing-coverts are barred, but less distinct than the other barred coverts, and within the variation of Oriental Cuckoo. However, the median coverts are more narrowly barred than is usual in Oriental Cuckoo. The greater coverts are slightly barred and their ground-colour is quite pale. The primary-coverts are more barred than in typical Oriental Cuckoos. The wing-bar continues outwards to P7 and is quite Oriental Cuckoo – shaped. On the right wing, there are 38 bars on P4-P10 and 40 on the left wing, which is good for Oriental. On the underparts, there are 7-8 uniform bars (depending on angle and position). The bars are not typical for *optatus* but narrower and more irregular – similar to many Eurasian Cuckoos. The ratio between white and black bars on the flanks is 2.88-3.20 in different repetitions of measuring, that is, they are quite narrow for Oriental Cuckoo. The undertail-coverts show 3-4 narrow, incomplete dark bars, narrower than is typical for *optatus*, but within the variation. The buff tone to the vent and undertail-coverts is strong and continues to the belly and underwing-coverts. This is very like Oriental Cuckoo. © Osmo Huupponen & Antero Lindholm.

More photos of this birds can be found in *Alula* (Vasamies 1998) and on the Internet: www.birdlife.fi/rk/identification/oriental-cuckoo.html and www.jmp.fi/˜pslty/kuva-galleria/idankaki.jpg

test variable (> 0) and p is the probability of the null hypothesis (0-1).

The method presupposes the variables are continuous and that the observations obey a multivariate normal distribution. In addition, it is presumed that the variances and correlations (the linear connections between the variables) between groups are similar. However, the discriminant analysis is a quite stable method and performs well even if all assumptions are not completely satisfied (Flury & Riedwyl 1988). Our material fulfills the assumptions reasonably well, and the method is suitable for our needs.

Five variables are used in the following analyses: period (T), time difference between the last note and the one preceding it (Δt), amplitude difference between these same notes (ΔA), mean frequency of the first main note (F1) and mean frequency of the second main note (F2). We performed discriminant analysis between "Siberian" (n = 45) and "European" (n = 12) *optatus*-recordings. The groups did not differ at all ($R^2 = 0.062$, $F = 0.670$, $p = 0.648$), which means that the geographical variation in *optatus* song is small or non-existent. Therefore, it was possible to combine these samples into one (n = 57).

Identification analysis is a special case of discriminant analysis where the size of the other sample is one. The null hypothesis is: the new observation is from the same group as the comparison sample. If the null hypothesis is rejected, the method will reveal to which group the observation actually belongs.

We did identification analysis for the Lieksa, Joutsa and Karstula birds using the means of variables measured from the recordings. According to the analysis, not one of the Finnish individuals is like *optatus*. The Lieksa bird has a higher-pitched first note and longer time difference between notes ($F = 13.482$, $p < 0,0001$), the Joutsa bird has a higher-pitched call and longer time difference ($F = 44.875$, $p < 0.0001$), the Karstula bird has a slower rhythm, both because of longer period and the greater difference between notes ($F = 14.920$, $p < 0.0001$). We also tested the similarity of identification functions of these individuals, that is, if the birds differed in a similar manner from *optatus*. The coefficient of concordance between the identification functions – or multivariate rank correlation – was significant ($W = 0,784$, $p = 0,038$). That means that the Finnish birds differed from Oriental Cuckoo in a similar way.

Identification using visual characters

Identification of Oriental and Eurasian Cuckoos are dealt with in the following articles: Baker (1993), Beaman & Madge (1998), Blom (1989), Cramp (1985), Dement'ev *et al* (1966), Flint *et al* (1984), Kennerley & Leader (1991), King *et al* (1975), Lehman (2000), Parkes (1990) and Vasamies (1998). We shall review their identification characters, but will confine ourselves to *optatus*, adult males and grey-morph females – and only those characters we have found useful. These are applied to the Lieksa and Joutsa birds, of which there are available photographs.

The Lieksa bird was trapped for measurements, photographs and ringing in 6 June 2001. The purpose was to collect as complete documentation as possible in order to compare the bird with known Eurasian and Oriental Cuckoos. We studied 35 Eurasian Cuckoo skins (all adult grey-morph birds from Finland or nearby areas) and one skin of Oriental Cuckoo at the Helsinki Zoological Museum. At The Natural History Museum, Tring (NHM) we studied 60 Eurasian Cuckoo skins from the British Isles, Nordic Countries, Iberia, Central Asia, Siberia and Northern China, 50 Oriental Cuckoo skins from Siberia, Japan, China, Indonesia, Australia and Pakistan, dozens of published and unpublished photos, three trapped adult Eurasian Cuckoo males and five trapped Oriental Cuckoos from Happy Island, Hebei, China (these were identified from plumage and measurements, not from song, the birds were migrants). Regarding measuring methods, cf. Table 3. Grey scales were estimated by comparing to Kodak Gray Scale (scale 1-20). The colour of the hindneck is estimated from the upper hindneck where the brown tinge is not as evident (and influential) as on the lower hindneck, the rump colour from the true rump area, not from the uppertail-coverts, which are darker. All these grey scale comparisons were confined to males.

Geographical variation of Eurasian Cuckoo

The geographical variation of Eurasian Cuckoo must be taken into account when studying the identification of Oriental Cuckoo. This is a very short summary.

Northern European and northern Asian birds are large and belong to nominate *canorus*. Using the Kodak Gray Scale, the breast was estimated as 5-6, the hindneck as 9-10 and the rump 9-10 (n=6). Wing length 213-230 mm. avg. 221 mm. (adult males, n=52), 204-216 mm. avg. 210 mm. (adult female, n=35) (Baker 1993), *cf.* also table 3 for our own measurements. The birds from northern East Asia are intermediate between the nominate *canorus* and *subtelephonus*.

In Iberia and Northern Africa there is *bangsi,* which is similar but smaller and therefore more difficult to separate from Oriental Cuckoo (Vaurie 1965, Baker 1993). The adult male has wing length 203-221 mm., avg. 210 mm., n=14 (Baker 1993), *cf.* also Table 2. *Bangsi* is quite a subtle subspecies.

Even Central Asian *subtelephonus* is small (Cramp 1985, Vaurie 1965). It is pale, with the grey colour especially on the breast but also on the hindneck and rump, quite clearly paler than on European birds (breast Kodak 3-4, hindneck 8-9, rump 8-9, n=5). The breast barring is narrower (pale bars 2.39-5.18 times wider than the dark ones, av.3.61, std dev. 0.890, n=10) and the underwing-coverts are paler and more sparsely marked.

The most important identification characters

Size. Oriental Cuckoo is smaller, wing length 198-221 mm, average 210 mm (adult male), 191-209 mm., avg. 198 mm(adult female) (Baker 1993), *cf.* Table 3. The Lieksa bird had a wing of 222 mm. It should be stressed that one should be critical when comparing wing lengths measured by different people and when comparing skin biometrics to live birds. Anyway, the wing length makes it clear that *optatus* is a smaller bird than *canorus* and the Lieksa bird was largish among the *optatus*.

Barring of underparts. The colour, width and density of the barring on the breast and belly are important characters. On Oriental Cuckoo, the barring is blacker, more well defined, sparser, and the individual bars are broader. The bars are difficult to measure, because the width varies throughout the length of each bar, and one bar can become broader or narrower inside a short distance. Both species have bars that are broader and more clear-cut on the flanks and become narrower and more irregular in the centre. Typically Oriental Cuckoo has 6-7 black bars crossing the whole belly. The barring of Eurasian Cuckoo is browner, not so clear-cut, and the individual bars thus more difficult to count, but there are 7-10 bars crossing the belly. The difference is at its clearest on the upper breast where even male Eurasian Cuckoos have narrower and more irregular barring. On Oriental Cuckoo the bars also become narrower on the upper breast, but not as much, and they remain quite easy to count. The Eurasian Cuckoos with few bars usually show very narrow bars (and such barring points strongly to Eurasian Cuckoo). This kind of pattern seems to be common only in eastern and south-eastern populations, but can also occur in Northern Europe. Some individuals are difficult, or impossible to identify using only the underpart barring.

The width of underpart barring was measured from high-resolution digital photographs by making the image seem larger so that only an area with five black bars was visible on the screen. The area was chosen from the flanks where the barring was most clear-cut and regular. From a straight line running across bars, every border between black and white was measured, and, using these coordinates, the ratio between the width of the white and the black bars was measured. *Optatus* – Oriental Cuckoo had on average 1.74 (1.07-2.88, stddev. 0.448, n=25) and *canorus* 2.15 (1.15-3.58, stddev. 0.634, n=33). There is much overlap but it is important to remember that this is only a part of the story of the underpart barring. The colour and the number of

Figure 12. Unidentified cuckoo, male, 1999, Joutsa, Finland. The white under greater-covert – primary band is strong and contrasting, but shorter and narrower than it normally is in Oriental Cuckoo, and seems to continue uniformly on to P5 or possibly to P6. It is not possible to count exactly the number of primary bars from the published photos, but it seems that the undertail-coverts are less distinctly buff, but more clearly barred than in the Lieksa bird. The buff tone seems to continue to the underwing-coverts. © Jari Kostet. More photos of this individual can be seen in *Alula* 1999, vol. 5 (3) p.90.