

Diversity of parasitic cuckoos and their hosts in China

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Abstract In this exposé we provide the first review of host use by brood parasitic cuckoos in a multiple-cuckoo system in China, based on our own long-term field data and a compilation of observations obtained from the literature. In total, we found that 11 species of cuckoos utilized altogether 55 host species. These hosts belong to 15 families, in which Sylviidae, Turdidae and Timaliidae account for 22.6%, 20.8% and 17.0% of parasitism records, respectively. The Common Cuckoo (*Cuculus canorus*) had the widest range of host species, accounting for 45.5% of the total number of parasitized species (25 in 10 families) of all parasitism records and is the most frequent brood parasite in the country. Cuckoo species differed in their egg coloration and the extent of egg polymorphism with most of them, e.g. the Common Cuckoo, the Lesser Cuckoo (*C. poliocephalus*) and the Plaintive Cuckoo (*Cacomantis merulinus*) laying well mimetic eggs with respect to their hosts based on human being's visual observations, while others such as the Large Hawk-cuckoo (*C. sparverioides*), the Himalayan Cuckoo (*C. saturatus*) and the Asian Emerald Cuckoo (*Chrysococcyx maculatus*) usually laid non-mimetic eggs. The use of cuckoo hosts and egg color variation in China are compared with those in other parts of their ranges in Asia.

Keywords brood parasitism, egg color, host use, multiple-cuckoo system, egg polymorphism

Introduction

Cuckoo-host systems are textbook examples of co-evolutionary arms races, although most of its research has focused on the Common Cuckoo (*Cuculus canorus*) and its hosts in Europe, where it is also the only brood parasite in most of the region. On the other hand, there

are a number of brood parasitic cuckoo species breeding in sympatry in Asia and many of these have drawn very little attention (Rothstein and Robinson, 1998; Payne, 2005). So far, at least 17 cuckoo species, belonging to six genera, have been recorded in China (MacKinnon and Phillipps, 1999; Zheng, 2011; Appendix 1, see also Fig. 1). For many of these cuckoo species, there is little information on their breeding biology and host use (Payne, 2005).

In our investigation we combined our long-term field data, an extensive review of mostly local papers as well as pictures of parasitized nests or cuckoo fledglings

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attended by hosts, taken by volunteer photographers in order to provide a detailed description of cuckoos and their host use in a multiple-cuckoo system in China. We also provide basic descriptions of egg coloration and egg morphs of the different cuckoos and their hosts.

Methods

Our parasitism records were obtained from 19 provinces in China, including Heilongjiang, Taiwan, Hong Kong and Xizang (Tibet). We employed three approaches to compile the dataset. First, we monitored the occurrence of parasitism in the nests of various passerines at our study area of Kuankuoshui Nature Reserve (28°06'–28°19'N, 107°02'–107°14'E), Guizhou Province, during 1999–2011. Egg color was described based on human

eyes whenever possible. Cuckoo species identification was accomplished by both morphology and DNA analysis of blood samples from adult cuckoos and nestlings, by sequencing the *Cytb* and *ND2* genes of cuckoo samples. Second, we supplemented our dataset by including data on parasitism records from all existing published sources in local journals on cuckoos and their hosts in China. Third, we included data from photographs of cuckoo chicks or fledglings attended by their foster parents taken opportunistically by birdwatchers in China (see supplementary figures). For these cases, an important point is host suitability. In this context we differentiated between which host species successfully raised a cuckoo chick and which did not. We also summarized the distribution and richness of breeding parasitic cuckoo species in all provinces of China.

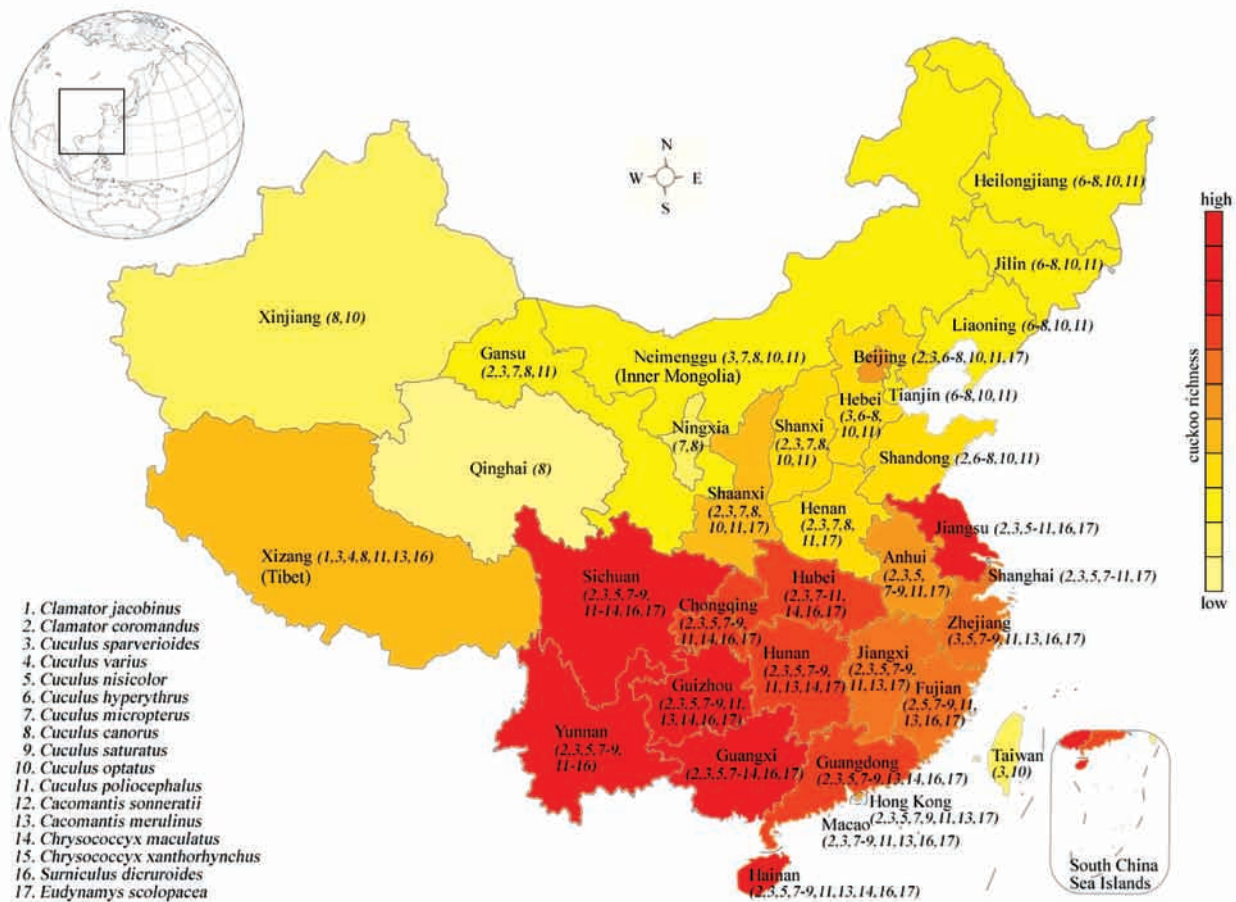


Fig. 1 Distribution and richness of breeding cuckoos in China. Numbers near the name of the provinces refer to the cuckoo species breeding in each province. Only residents or summer breeders are included.

Results

We obtained 142 parasitism records of 11 cuckoo species (out of all 17 species in China, i.e., 64.7%) from 55 host species, with the hosts of six cuckoo species still unknown in China (Table 1, Appendix 1). Host species were diverse passerines, belonging to 15 families, including Motacillidae, Pycnonotidae, Laniidae, Dicru-ridae, Sturnidae, Corvidae, Troglodytidae, Turdidae, Muscicapidae, Timaliidae, Paradoxornithidae, Emberi-zidae, Fringillidae, Cisticolidae and Sylviidae. The most extensively used families were Sylviidae, Turdidae and Timaliidae which, respectively, accounted for 22.6%, 20.8% and 17.0% of the parasitism records. Overall, some of the cuckoo species, such as the Common Cuckoo, the Indian Cuckoo (*Cuculus micropterus*), the Himalayan Cuckoo (*C. saturatus*) and the Oriental Cuckoo (*C. optatus*) use more and taxonomically diverse host species and seem to be generalist parasites, while others, such as the Lesser Cuckoo (*C. poliocephalus*), the Plaintive Cuckoo (*Cacomantis merulinus*) and the Asian Emerald Cuckoo (*Chrysococcyx maculatus*) are specialized in their host use, exploiting a more restricted range of related host species, as well as having a special nest design (domed nests) (Table 2). The Common Cuckoo seems to be the most catholic in its host use since as many as 45.5% (25/55 species, 10 families) of the recorded host species were its hosts (Table 1). However,

Common Cuckoo parasitism is also over-represented in our dataset, where it accounts for as much as 40.1% (57/142) of parasitism records.

The highest density of cuckoos is found in the southern parts of the country (Fig. 1). The provinces with the highest richness of breeding cuckoos in China are Guangxi (13 species), Yunnan (12 species), Sichuan (12 species), Guizhou (11 species), Jiangsu (11 species) and Hainan (11 species). The northern provinces, such as Qinghai, Xinjiang and Ningxia have the lowest cuckoo richness, with typically one or two breeding cuckoo species. Seven cuckoo species breed in Xizang; however, five of them are breeding in the southeast of Xizang near the borders with Sichuan and Yunnan.

The data suggests little overlap in host use of the different species, since only 12.7% (7/55) of all the host species were hosts of more than one cuckoo species (two in all the cases).

Based on our visual observations, we conclude that most of the cuckoo species lay more or less mimetic eggs, except for the Large Hawk-cuckoo (*Cuculus sparverioides*), the Himalayan Cuckoo and the Asian Emerald Cuckoo which lay poorly mimetic or non-mimetic eggs with most of their hosts (Appendix 1). In some cuckoo species, perfect egg mimicry is evident, e.g. the Common Cuckoo and its parrotbill hosts (Yang et al., 2010b). Marked egg mimicry is also the rule for the Lesser Cuckoo and its typically *Cettia* warbler hosts,

Table 1 Parasitism records of cuckoos and their hosts in China

Cuckoo species	Number of host species	Number of parasitism nests	Number of cuckoo eggs recorded	Number of cuckoo nestlings recorded	Number of cuckoo egg morphs
Chestnut-winged Cuckoo (<i>Clamator coromandus</i>)	4	10	3	7	1
Large Hawk-cuckoo (<i>Cuculus sparverioides</i>)	7	15	15	1	2
Indian Cuckoo (<i>Cuculus micropterus</i>)	6	9	4	5	1
Common Cuckoo (<i>Cuculus canorus</i>)	24	57	22	35	10
Himalayan Cuckoo (<i>Cuculus saturatus</i>)	5	8	6	2	1
Oriental Cuckoo (<i>Cuculus optatus</i>)	8	9	5	4	2
Lesser Cuckoo (<i>Cuculus poliocephalus</i>)	4	11	6	5	2
Plaintive Cuckoo (<i>Cacomantis merulinus</i>)	1	8	3	5	1
Asian Emerald (Cuckoo <i>Chrysococcyx maculatus</i>)	4	10	2	8	1
Asian Drongo Cuckoo (<i>Surniculus lugubris</i>)	1	1	–	1	–
Asian Koel (<i>Eudynamis scolopacea</i>)	4	7	2	5	1

Table 2 Host use by parasitic cuckoos in China

Host name	Nest type	CWC	LHC	IC	CC	HC	OC	LC	PC	AEC	ADC	AK	Total
Rufous-tailed Shrike (<i>Lanius isabellinus</i>)	Shrub, open	–	–	–	3	–	–	–	–	–	–	–	3
Brown Shrike (<i>Lanius cristatus</i>)	Shrub, open	–	–	–	3	–	–	–	–	–	–	–	3
Grey-backed Shrike (<i>Lanius tephronotus</i>)	Shrub, open	–	–	–	1	–	–	–	–	–	–	–	1
Red-billed Blue Magpie (<i>Urocissa erythrorhyncha</i>)	Tree, open	–	–	–	–	–	–	–	–	–	–	2	2
Azure-winged Magpie (<i>Cyanopica cyanus</i>)	Tree, open	–	–	3	1	–	–	–	–	–	–	–	4
Magpie (<i>Pica pica</i>)	Tree, open	–	1	–	–	–	–	–	–	–	–	2	3
Black Drongo (<i>Dicrurus macrocercus</i>)	Tree, open	–	–	1	–	–	–	–	–	–	–	–	1
Eurasian Blackbird (<i>Turdus merula</i>)	Tree, open	–	–	1	–	–	–	–	–	–	–	–	1
Bluethroat (<i>Luscinia svecica</i>)	Ground, open	–	–	–	1	–	–	–	–	–	–	–	1
Slaty-backed Forktail (<i>Enicurus schistaceus</i>)	Ground, semi-open	–	–	–	–	1	–	–	–	–	–	–	1
Lesser Shortwing (<i>Brachypteryx leucophrys</i>)	Tree, open	–	–	–	–	–	1	–	–	–	–	–	1
Black Redstart (<i>Phoenicurus ochruros</i>)	Semi-open	–	–	–	2	–	–	–	–	–	–	–	2
Daurian Redstart (<i>Phoenicurus aureus</i>)	Hole, semi-open	–	–	–	8	–	–	–	–	–	–	–	8
Plumbeous Water Redstart (<i>Rhyacornis fuliginosus</i>)	Semi-open	–	–	–	1	–	–	–	–	–	–	–	1
White-bellied Redstart (<i>Hodgsonius phaenicuroides</i>)	Shrub, open	–	–	–	2	–	–	–	–	–	–	–	2
Oriental Magpie Robin (<i>Copsychus saularis</i>)	Hole	–	–	–	1	–	–	–	–	–	–	–	1
Common Stonechat (<i>Saxicola torquata</i>)	Shrub, open	–	–	–	1	–	1	–	–	–	–	–	2
Grey Bushchat (<i>Saxicola ferreus</i>)	Ground, semi-open	–	–	–	2	–	–	–	–	–	–	–	2
Black-collared Starling (<i>Sturnus nigricollis</i>)	Semi-open	–	–	–	–	–	–	–	–	–	–	2	2
Light-vented Bulbul (<i>Pycnonotus sinensis</i>)	Shrub, open	–	–	1	–	–	–	–	–	–	–	–	1
Collared Finchbill (<i>Spizixos semitorques</i>)	Shrub, open	–	–	–	–	1	–	–	–	–	–	–	1
Blue-and-white Flycatcher (<i>Cyanoptila cyanomelana</i>)	Tree hole	–	–	–	1	–	–	1	–	–	–	–	2
Brownish-flanked Bush Warbler (<i>Cettia fortipes</i>)	Shrub, semi-open	–	–	–	–	1	–	9	–	–	–	–	10
Aberrant Bush Warbler (<i>Cettia flavolivacea</i>)	Shrub, semi-open	–	–	–	–	–	–	1	–	–	–	–	1
Common Tailorbird (<i>Orthotomus sutorius</i>)	Tree, open	–	–	–	–	–	–	–	8	–	–	–	8
Black-browed Reed Warbler (<i>Acrocephalus bistrigiceps</i>)	Shrub, open	–	–	–	1	–	–	–	–	–	–	–	1
Oriental Reed Warbler (<i>Acrocephalus orientalis</i>)	Shrub, open	–	–	2	4	–	–	–	–	–	–	–	6
Buff-throated Warbler (<i>Phylloscopus subaffinis</i>)	Ground, domed	–	–	–	–	–	–	–	–	1	–	–	1
Humes' Warbler (<i>Phylloscopus humei</i>)	Ground, domed	–	–	–	–	–	1	–	–	–	–	–	1
Pale-legged Leaf Warbler (<i>Phylloscopus tenellipes</i>)	Ground, domed	–	–	–	2	–	1	–	–	–	–	–	3
Eastern Crowned Warbler (<i>Phylloscopus coronatus</i>)	Ground, domed	–	–	–	–	–	1	–	–	–	–	–	1
Blyth's Leaf Warbler (<i>Phylloscopus reguloides</i>)	Ground, domed	–	–	–	–	3	–	–	–	1	–	–	4
Bianchi's Warbler (<i>Seicercus valentine</i>)	Ground, domed	–	–	–	–	–	–	–	–	7	–	–	7
Chestnut-crowned Warbler (<i>Seicercus castaniceps</i>)	Ground, semi-open	–	–	–	–	–	–	–	–	1	–	–	1
Yellow-bellied Prinia (<i>Prinia flaviventris</i>)	Shrub, open	–	–	–	–	–	2	–	–	–	–	–	2
Zitting Cisticola (<i>Cisticola juncidis</i>)	Shrub, semi-open	–	–	–	1	–	–	–	–	–	–	–	1
Masked Laughingthrush (<i>Garrulax perspicillatus</i>)	Shrub, open	–	1	–	–	–	–	–	–	–	–	1	2

Table 2 (Continued)

Host name	Nest type	CWC	LHC	IC	CC	HC	OC	LC	PC	AEC	ADC	AK	Total
Greater Necklaced Laughingthrush (<i>Garrulax pectoralis</i>)	Shrub, open	5	–	–	–	–	–	–	–	–	–	–	5
Hwamei (<i>Garrulax canorus</i>)	Ground, open	2	2	–	–	–	–	–	–	–	–	–	4
White-browed Laughingthrush (<i>Garrulax sannio</i>)	Shrub, open	–	4	–	–	–	–	–	–	–	–	–	4
Elliot's Laughingthrush (<i>Garrulax elliotii</i>)	Shrub, open	–	1	–	–	–	–	–	–	–	–	–	1
Grey-cheeked Fulvetta (<i>Alcippe morrisonia</i>)	Shrub, open	–	–	–	–	–	–	–	–	–	1	–	1
Spot-breasted Scimitar Babbler (<i>Pomatorhinus erythrocnemis</i>)	Ground, semi-open	–	1	–	–	–	–	–	–	–	–	–	1
Rufous-capped Babbler (<i>Stachyris ruficeps</i>)	Shrub, semi-open	–	–	–	–	–	1	–	–	–	–	–	1
Chinese Babax (<i>Babax lanceolatus</i>)	Shrub, open	–	5	–	–	–	–	–	–	–	–	–	5
Reed Parrotbill (<i>Paradoxornis heudei</i>)	Shrub, open	–	–	–	1	–	–	–	–	–	–	–	1
Vinous-throated Parrotbill (<i>Paradoxornis webbianus</i>)	Shrub, open	–	–	–	2	–	–	–	–	–	–	–	2
Ashy-throated Parrotbill (<i>Paradoxornis alphonsianus</i>)	Shrub, open	–	–	–	11	–	–	–	–	–	–	–	11
Wren (<i>Troglodytes troglodytes</i>)	Semi-open	–	–	–	–	–	–	1	–	–	–	–	1
White Wagtail (<i>Motacilla alba</i>)	Semi-open	–	–	–	2	–	1	–	–	–	–	–	3
Richard's Pipit (<i>Anthus richardi</i>)	Shrub, open	–	–	–	1	–	–	–	–	–	–	–	1
Desert Finch (<i>Rhodospiza obsoleta</i>)	Tree, open	–	–	–	1	–	–	–	–	–	–	–	1
Black-faced Bunting (<i>Emberiza spodocephala</i>)	Ground, open	–	–	–	2	–	–	–	–	–	–	–	2
Jankowski's Bunting (<i>Emberiza jankowskii</i>)	Ground, open	–	–	–	2	–	–	–	–	–	–	–	2
Yellow-throated Bunting (<i>Emberiza elegans</i>)	Ground, open	–	–	–	–	2	–	–	–	–	–	–	2
Total number of species		2	7	5	25	5	8	4	1	4	1	4	NA
Total number of records		7	15	8	57	8	9	12	8	10	1	7	142

Note: abbreviation of cuckoo species: CWC, Chestnut-winged Cuckoo; LHC, Large Hawk-cuckoo; IC, Indian Cuckoo; CC, Common Cuckoo; HC, Himalayan Cuckoo; OC, Oriental Cuckoo; LC, Lesser Cuckoo; PC, Plaintive Cuckoo; AEC, Asian Emerald Cuckoo; ADC, Asian Drongo Cuckoo; AK, Asian Koel. Numbers in the table refer to the times of parasitism records.

with both parties laying uniform chocolate- or red-brown eggs (Yang et al., 2010a). However, these same cuckoo species may lay non-mimetic or poorly mimetic eggs with some other hosts; e.g. Common Cuckoos lay light cyan eggs with brown spots in contrast to the white and brown-spotted eggs of its Black-browed Reed Warbler (*Acrocephalus bistrigiceps*) host and the Lesser Cuckoo parasitizing Blue-and-white Flycatcher (*Cyanoptila cyanomelana*) lays light cyan eggs while the host eggs are white (Appendix 1). The Oriental Cuckoo lays highly- or intermediately mimetic eggs with their hosts, mainly leaf warbler hosts. The eggs of the closely related Himalayan Cuckoo appear to be mimetic only to the eggs of some *Phylloscopus* or *Seicercus* warblers, which may be its main hosts, but this cuckoo species frequently parasitizes a variety of other host species, differing greatly in egg coloration and hence its mim-

icry is often very poor.

The eggs of the Large Hawk-cuckoo are typically non-mimetic, with whitish with brown spots in the nests of Elliot's Laughingthrush (*Garrulax elliotii*), the Masked Laughingthrush (*G. perspicillatus*), the Spot-breasted Scimitar Babbler (*Pomatorhinus erythrocnemis*) and the Eurasian Blackbird (*Turdus merula*). Of these four hosts, the first one lays light sky-blue eggs with brown spots and streaks, the second one lays light cyan eggs, the third one lays white egg and the last one lays light cyan eggs with brown spots. The Large Hawk-cuckoo lays white eggs in the nest of the Chinese Babax (*Babax lanceolatus*) which has deep blue eggs (Yang et al., 2012) and also parasitizes Hwamei (*Garrulax canorus*) in Guangxi Province, laying deep blue eggs as well.

The existence of distinctive egg morphs is differ-

ently pronounced among the cuckoo species. The most polymorphic were the eggs of the Common Cuckoos, of which we could identify 10 egg morphs: 1) turquoise, unspotted, 2) pale blue, unspotted, 3) white, unspotted, 4) dark turquoise, unspotted, 5) turquoise with violet spots, 6) white with grey spots, 7) whitish with brown spots, 8) light cyan with brown spots, 9) pinkish white with sandy brown spots and 10) offwhite with olive spots. Most of these mimic to some extent the eggs of their diverse host species or genera, suggesting the existence of host races (*gentes*). At the other extreme are the Himalayan Cuckoo and the Asian Emerald Cuckoo which, according to our data, have only one egg morph, white with few tiny brown spots and yellowish-white with brown spots, respectively, regardless of the eggs of the host species. The hosts of the former lay white, chocolate-brown, offwhite with black spots and pink with violet spotted eggs while those of the latter lay white eggs.

Discussion

Our study provides the first synthesis of the available data on host use of cuckoos in China. Some cuckoo species appeared to be more generalists in host use, while others were specialized in their host use, parasitizing a few related host species. However, our results must be viewed as preliminary, since the research effort was not equally distributed among the different cuckoo species, their hosts and areas. Some cuckoos also have overlapping ranges of host species, but the data are insufficient to allow reliable estimates of such overlaps and their importance. With several cuckoo species breeding sympatrically, host use segregation as a result of interspecific competition is to be expected as indicated by evidence from Japan (e.g. Higuchi, 1998). Since there are many more species of coexisting cuckoos in China, we expect more pronounced host segregation, a phenomenon to be demonstrated by future studies.

Most of the cuckoo species showed some degree of adaptation in egg phenotypes to their respective hosts as evidenced by egg mimicry in most cases, except for the Large Hawk-cuckoo and the Asian Emerald Cuckoo. There are some clear cases of very good egg matching, e.g. in the Lesser Cuckoo and their warbler hosts as well

as in the Common Cuckoo and parrotbills (see also Yang et al., 2010a, 2010b), suggesting a long history of co-evolutionary interactions and advanced arms races. However, egg color descriptions in our study are based on human vision which differs dramatically from avian vision (e.g. Cherry and Bennett, 2001). Thus, more objective techniques to quantify egg color, such as visual modeling (e.g. Yang et al., 2010b; Antonov et al., 2011), are needed to establish how well the eggs of the different cuckoos match the eggs of their hosts from the perspective of avian vision. What remains to be shown is the existence of host races (*gentes*) within each cuckoo species. Furthermore, egg recognition and rejection abilities of the different hosts must be tested experimentally to understand the variation in egg mimicry among and within cuckoo species.

According to our data, the Chestnut-winged Cuckoo (*Clamator coromandus*) in China parasitizes the Hwamei, a laughingthrush mainly found in southern parts of the country. We did not find any eggs of this cuckoo and have therefore no information on whether they mimic the deep blue eggs of its Hwamei host. In India and Sri Lanka, the Chestnut-winged Cuckoo uses other species of laughingthrush, often the Greater Necklaced Laughingthrush (*Garrulax pectoralis*) and the Lesser Necklaced Laughingthrush (*G. monileger*) (Osmaston, 1916; Mackenzie, 1918; Baker, 1942; Becking, 1981). Their eggs are pale blue and unmarked.

In China, besides three species of common laughingthrushes, the Large Hawk-cuckoo (*Cuculus sparverioides*) also parasitizes the Chinese Babax (*Babax lanceolatus*), the Spot-breasted Scimitar Babbler (*Pomatorhinus erythrocnemis*) and the Eurasian Blackbird (*Turdus merula*). We recorded three cuckoo egg morphs, 1) unspotted white, 2) unspotted skyblue and 3) whitish brown, spotted. The plain egg white morph has only been described in China so far by Yang et al. (2012). Most of the Large Hawk-cuckoo breeding records outside China are from India and show that they parasitize laughingthrushes, the Himalayan Whistlingthrush (*Myiophonus caeruleus*), the Nepal Shortwing (*Brachypteryx leucophrys*), the Hoary Barwing (*Actinodura nipalensis*), the Large Spiderhunter (*Arachnothera magna*) and other songbirds (Hume, 1873; Baker, 1906,

1934; Becking, 1981). Cuckoo eggs in India are of two morphs, 1) light brownish olive, seldom with darker specks and 2) blue, unspotted (Baker, 1906, 1907; Osmaston, 1912, 1916).

We found that Chinese Common Cuckoos parasitize 3 species of parrotbills, 4 species of redstarts, 2 species of reed warblers, 2 species of buntings, 2 species of chats and 1 species each of bluethroats, cisticolas, flycatchers, magpies, leaf warblers, pipits, shrikes, wagtails and finches. The Common Cuckoo seems to be using all potential insectivorous songbirds suitable as hosts. This species has more than 100 host species in Europe and India, including flycatchers, chats, warblers, wagtails and buntings (Payne, 2005). In Japan, this cuckoo parasitizes at least 20 host species (Higuchi, 1998; Nakamura et al., 1998) and in Korea their hosts are the Daurian Redstart (*Phoenicurus aureoreus*) and the Vinous-throated Parrotbill (*Paradoxornis webbianus*) (Yoon, 2000). Cuckoo eggs are polymorphic in coloration (6 morphs identified), and typically good mimics of the eggs of their respective host species, indicative of the existence of host-specific races as in Europe where at least 15 cuckoo egg morphs are recognized (Moksnes et al., 1995).

The Himalayan and Oriental Cuckoos use predominantly warblers of the genera *Phylloscopus* and *Seicercus* as hosts (Payne, 2005), which we also found to be the case in China. Eggs are pale blue or white with fine black and brown or reddish stippling (Baker, 1906, 1927, 1934). Furthermore, they use the Yellow-bellied Prinia (*Prinia flaviventris*) which is widespread in the south of China as well as the White Wagtail (*Motacilla alba*) in Altai, the northernmost area of Xinjiang Autonomous Region. They also parasitize the Brownish-flanked Bush Warbler (*Cettia fortipes*) which is the main host of the Lesser Cuckoo. Other host species include the Slaty-backed Forktail (*Enicurus schistaceus*), the Yellow-throated Bunting (*Emberiza elegans*), the Collared Finchbill (*Spizixos semitorques*), the Stonechat (*Saxicola torquata*), the Lesser Shortwing (*Brachypteryx leucophrys*) and the Rufous-capped Babbler (*Stachyris ruficeps*). In China, cuckoo eggs found in these host species are white or white with brown spots.

In China, Lesser Cuckoos use two species of bush

warblers, the Winter Wren (*Troglodytes troglodytes*) and the Blue-and-white Flycatcher as hosts. Eggs are brown and light cyan, unspotted. In southeast Siberia in Ussuria, Japan and India, the Lesser Cuckoo parasitizes leaf warblers (*Phylloscopus ijimae* and *P. occipitalis*), bush warblers (*Cettia diphone*) and Winter Wrens (Payne, 2005). Cuckoo eggs are immaculately brown (Neufeldt, 1971; Higuchi, 1989, 1998), red or white (Baker, 1906, 1934).

Indian Cuckoo hosts in China are the Azure-winged Magpie (*Cyanopica cyanus*), the Oriental Reed Warbler (*Acrocephalus orientalis*), the Light-vented Bulbul (*Pycnonotus sinensis*), the Black Drongo (*Dicrurus macrocerus*), the Eurasian Blackbird (*Turdus merula*) and the Common Stonechat. We recorded only two cuckoo egg morphs — pinkish white or offwhite with firebrick markings. Indian Cuckoos in Russia parasitize the Brown Shrike (*Lanius cristatus*) (Neufeldt, 1966). In south-eastern Asia, they parasitize drongos and lay highly mimetic eggs (Becking 1981; Payne, 2005; Begum et al., 2012). In the Malay Peninsula at Selangor fledglings were observed being fed by a non-passerine bird, the Black-and-yellow Broadbill (*Eurylaimus ochromalus*) (Wells, 1999). Eggs are either white with reddish-brown markings or unmarked blue (Neufeldt, 1966; Baker, 1906, 1907, 1934, 1942).

The only Plaintive Cuckoo host we found in China was the Common Tailorbird (*Orthotomus sutorius*) but in other parts of its range in Asia, many hosts have been recorded, such as the Yellow-bellied Prinia (*Prinia flaviventris*) and the Black-necked Tailorbird (*Orthotomus atrogularis*) in the Malay Peninsula (Wells, 1999), the Olive-backed Tailorbird (*O. sepium*) in Java (Hellebrekers and Hoogerwerf, 1967; Becking, 1981), prinias and tailorbirds in Borneo (Smythies, 1957, 1999) and the Grey-backed Tailorbird (*O. derbianus*) in the Philippines (Hornskov, 1995). In Sabah, the Indian Cuckoo is said to parasitize the Common Iora (*Aegithina tiphia*), the Streaky-breasted Spiderhunter (*Arachnothera affinis*) and the Yellow-bellied Prinia (Sheldon et al., 2001). Eggs are dull, light buff to green with light olive markings (Baker, 1906, 1907, 1934; Hoogerwerf, 1949; Hellebrekers and Hoogerwerf, 1967; Becking, 1981).

The major host of the Asian Emerald Cuckoo in Guizhou Province of China is the Bianchi's Warbler

(*Seicercus valentini*). This cuckoo species also parasitizes the Blyth's Leaf Warbler which is also host to the Himalayan Cuckoo. Other host species in China are the Chestnut-crowned Warbler (*S. castaneiceps*) and the Buff-throated Warbler (*Phylloscopus subaffinis*). The color of the cuckoo eggs we recorded was offwhite with brown spots concentrated at the blunt end. The Asian Emerald Cuckoo hosts in India are the Yellow-backed Sunbird (*Aethopyga siparaja*), the Little Spiderhunter (*A. longirostra*) (Baker, 1919) and the Chestnut-crowned Warbler (*Seicercus castaneiceps*) (Stevens, 1925). The eggs are whitish, blotched with light brown or reddish brown (Baker, 1906, 1942; Harrison, 1969; Becking, 1981).

The Asian Koel in China uses one species of starling, two species of magpies and one species of laughingthrush as hosts, while in south-eastern Asia it uses crows as common hosts (Begum et al., 2011a, b). From these hosts, the Black-billed Magpie (*Pica pica*) and the Masked Laughingthrush (*Garrulax perspallatus*) are also parasitized by the Large Hawk-cuckoo. With regard to the Asian Drongo Cuckoo, only one host species, the Grey-cheeked Fulvetta (*Alcippe morrisonia*), has been recorded so far in China.

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中国的寄生性杜鹃及其宿主多样性

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摘要: 通过多年的调查资料、观鸟爱好者所提供的图片和文献整理, 我们对多杜鹃寄生系统下的中国寄生性杜鹃及其宿主的多样性进行了系统研究。在中国分布的 17 种寄生性杜鹃中, 迄今已发现 11 种杜鹃的宿主达 55 种, 均为雀形目鸟类, 隶属于 15 科, 其中莺科、鹎科和画眉科分别占到寄生记录总数的 22.6%、20.8% 和 17.0%。大杜鹃 (*Cuculus canorus*) 的宿主种类最多 (45.5%), 是中国最常见、宿主多样性最丰富的寄生性杜鹃。不同种类的寄生性杜鹃的卵色不同, 而且杜鹃与其宿主之间均呈现明显的卵色多态性, 为典型的卵色协同进化。基于人眼观察, 大杜鹃、小杜鹃 (*C. poliocephalus*) 和八声杜鹃 (*Cacomantis merulinus*) 的卵色均与其宿主高度模拟, 而鹰鹃 (*Cuculus sparverioides*)、中杜鹃 (*C. saturatus*) 和翠金鹃 (*Chrysococcyx maculatus*) 则产非模拟的卵。目前仍有 6 种寄生性杜鹃的宿主不详, 亟待加强研究。

关键词: 巢寄生, 卵色, 宿主利用, 多杜鹃寄生系统, 卵色多态性

Appendix 1 Parasitic cuckoos species and their hosts in China

Cuckoo name	Host name	Nest contents	Note contents	Cuckoo egg mass (g) and size (mm)	Cuckoo egg color	Host egg mass (g) and size (mm)	Host egg color	Source
Chestnut-winged Cuckoo (<i>Clamator coromandus</i>)	Hwamei (<i>Garrulax canorus</i>)	Nestling	IC+3H		Blue		Blue	Jia et al., 2007
		Nestling Egg	IC+3H		Blue		Blue	Jia et al., 2007 La Touche, 1931–34
	Masked Laughingthrush (<i>Garrulax perspicillatus</i>)	Egg			Blue		Blue	La Touche, 1931–34
	Greater Necklaced Laughingthrush (<i>Garrulax pectoralis</i>)	Nestling	IC					Carey et al., 2001
		Nestling	IC					Carey et al., 2001
		Nestling	IC					Carey et al., 2001
		Nestling	IC					Carey et al., 2001
		Nestling	2C+6H		Blue		Blue	This study
	Oriental Magpie Robin (<i>Copsychus saularis</i>)	Egg			Blue			Guangdong Institute of Entomology and Sun Yat-sen University, 1983
Large Hawk-cuckoo (<i>Cuculus sparveroides</i>)	Chinese Babax (<i>Babax lanceolatus</i>)	Egg	1C+2H	6.6, 27.1 × 21.4	White	6.0, 27.8 × 20.6	Deep sky blue	Yang et al., 2012
		Egg	1C+2H		White		Deep sky blue	This study
		Egg	1C+1H		White		Deep sky blue	This study
		Egg	1C+1H		White		Deep sky blue	This study
		Egg	1C+2H		White		Deep sky blue	This study
White-browed Laughingthrush (<i>Garrulax sannio</i>)		Egg	1C+4H	6.2, 27.0 × 20.6	White	5.7, 27.8 × 19.7	White	Jiang et al., 2007
		Egg	1C+2H	7.5, 30.4 × 21.8	White	5.3, 26.1 × 20.0	White	This study
		Egg	1C+1H		White		Blue	This study
		Egg	1C+1H		White		Blue	This study
Elliot's Laughingthrush (<i>Garrulax elliotii</i>)		Egg		4.5–5.0, 25.0 × 19.0–27.0 × 19.5	Offwhite with brown spots	5.8, 28.2 × 20.1	Light sky blue with brown spots and steaks	Fan et al., 2000

Appendix 1 (Continued)

Cuckoo name	Host name	Nest contents	Note contents	Cuckoo egg mass (g) and size (mm)	Cuckoo egg color	Host egg mass (g) and size (mm)	Host egg color	Source
	Masked Laughingthrush (<i>Garrulax perspicillatus</i>)	Egg		4.5–5.0, 25.0 × 19.0–27.0 × 19.5	Offwhite with brown spots	5.6, 29.0 × 21.0	Light cyan	Fan et al., 2000
	Spot-breasted Scimitar Babbler (<i>Pomatorhinus erythrocnemis</i>)	Egg		4.5–5.0, 25.0 × 19.0–27.0 × 19.5	Offwhite with brown spots	6.5, 28.3 × 20.7	White	Fan et al., 2000
	Hwamei (<i>Garrulax canorus</i>)	Nestling	IC					This study
	Black-billed Magpie (<i>Pica pica</i>)	Egg	1C+2H		White		Blue	This study
	Indian Cuckoo (<i>Cuculus micropterus</i>)	Egg	2C+4H	4.7, 26.2 × 19.2	Olive grey with brown spots			Cheng et al., 1991
	Azure-winged Magpie (<i>Cyanopica cyanus</i>)	Nestling						Yan et al., 1985
		Egg		4.0, 21.0 × 17.5–24.0 × 18.0		6.0, 28.1 × 20.2	Lightcyan with brown and purple spots	Bu et al., 1999
	Oriental Reed Warbler (<i>Acrocephalus orientalis</i>)	Fledgling						This study
		Egg		4.0, 21.0 × 17.5–24.0 × 18.0		3.8, 22.4 × 16.0	Offwhite with olive spots	Bu et al., 1999; Hao and Wang, 1992;
	Light-vented Bulbul (<i>Pycnonotus sinensis</i>)	Nestling						Yan et al., 1985; Liu and Long, 1986
	Black Drongo (<i>Dicrurus macrocerus</i>)	Egg	1C+2H		Pinkish white with firebrick spots	4.8, 24.7 × 18.6	Lightpink with brown spots	Vaughan and Jones, 1913; Zhang, 2001
	Eurasian Blackbird (<i>Turdus merula</i>)	Egg	1C+2H	6.8, 29.5 × 22.7	Offwhite with firebrick spots	7.2, 29.1 × 21.4	Lightcyan with brown spots	Zhou et al., 2001
	Common Stonechat (<i>Saxicola torquata</i>)	Nestling						Cheng et al., 1991
	Ashy-throated Parrotbill (<i>Paradoxornis alphonisianus</i>)	Egg	1C+4H	2.6, 20.8 × 16.2	Turquoise	1.3, 16.1 × 12.7	Turquoise	Yang et al., 2010b
		Nestling	IC					This study
		Nestling	IC					This study
		Egg	1C+2H		Turquoise		Turquoise	Yang et al., 2010b
		Egg	1C+3H		Turquoise		Turquoise	Yang et al., 2010b

Appendix 1 (Continued)

Cuckoo name	Host name	Nest contents	Note contents	Cuckoo egg mass (g) and size (mm)	Cuckoo egg color	Host egg mass (g) and size (mm)	Host egg color	Source
		Nestling	IC					This study
		Nestling	IC					This study
		Nestling	IC					This study
		Nestling	IC					This study
		Egg	IC	3.0, 21.4 × 16.2	Paleblue			This study
		Egg	IC+2H	3.1, 21.6 × 16.2	White	1.2, 16.7 × 12.4	Paleblue	This study
	Vinous-throated Parrotbill (<i>Paradoxornis webbianus</i>)	Fledgling						This study
		Egg			Turquoise with violet spots			Cheng, 1963, 1973
	Reed Parrotbill (<i>Paradoxornis heudei</i>)	Egg	IC+2H		Offwhite with olive spots		Offwhite with olive spots	This study
	Daurian Redstart (<i>Phoenicurus aureus</i>)	Nestling	IC					This study
		Egg	IC+4H	2.8, 20.8 × 16.3	White with grey spots	1.7, 17.9 × 13.7	Pale turquoise with firebrick spots	This study
		Egg	IC+5H		White with grey spots		White with firebrick spots	This study
		Egg	IC+3H					This study
		Nestling	IC					This study
		Egg	IC+3H		White with grey spots		White with firebrick spots	This study
		Nestling	IC					This study
		Nestling	IC					Cheng, 1963, 1973
	Black Redstart (<i>Phoenicurus ochruros</i>)	Nestling	IC					This study
		Fledgling						This study
	White-bellied Redstart (<i>Hodgsonius phaenicauroides</i>)	Egg	IC+3H	3.8, 25.9 × 17.9	Dark turquoise		Dark turquoise	This study
		Egg	IC+3H	3.8, 25.1 × 18.0	Dark turquoise		Dark turquoise	This study
	Plumbeous Water Redstart (<i>Rhyacornis fuliginosus</i>)	Nestling	IC					This study
	Bluethroat (<i>Luscinia svecica</i>)	Nestling						Qian and Zhang, 1965
	Common Stonechat (<i>Saxicola torquata</i>)	Fledgling						This study

Appendix 1 (Continued)

Cuckoo name	Host name	Nest contents	Note contents	Cuckoo egg mass (g) and size (mm)	Cuckoo egg color	Host egg mass (g) and size (mm)	Host egg color	Source
	Grey Bushchat (<i>Saxicola ferreus</i>)	Egg	1C+3H	2.7, 20.1 × 16.0	Dark turquoise	1.9, 17.6 × 14.4	Medium turquoise	This study
		Egg	1C+4H					This study
	White Wagtail (<i>Motacilla alba</i>)	Fledgling						This study
		Nestling	1C					Li et al., 1985
	Richard's Pipit (<i>Anthus richardi</i>)	Fledgling						This study
	Oriental Reed Warbler (<i>Acrocephalus orientalis</i>)	Nestling						Lu, 1988; Hao and Wang, 1992
		Fledgling						This study
		Fledgling						This study
		Egg		4.4, 24.0 × 18.0	Offwhite with brown spots	3.8, 22.4 × 16.0	Offwhite with olive spots	Tian et al., 1991
		Fledgling						This study
	Black-browed Reed Warbler (<i>Acrocephalus bistrigiceps</i>)	Egg	1C+4H	3.6, 25.0 × 17.3	Lightcyan with brown spots	1.3, 13.8 × 10.7	Offwhite with brown spots	Liu et al., 1984
	Pale-legged Leaf Warbler (<i>Phylloscopus tenellipes</i>)	Egg		1.8, 21.5 × 13.3	Pinkish white with sandy brown spots	1.5, 15.6 × 12.3	Pinkish white	Gao, 2004
		Nestling						Fu et al., 1984
	Zitting Cisticola (<i>Cisticola juncidis</i>)	Egg			Turquoise with violet spots			Cheng et al., 1991
	Rufous-tailed Shrike (<i>Lanius isabellinus</i>)	Fledgling						This study
		Fledgling						This study
		Fledgling						This study
	Brown Shrike (<i>Lanius cristatus</i>)	Eggs						Qian and Zhang, 1965
		Fledgling						This study
		Fledgling						This study
	Grey-backed Shrike (<i>Lanius tephronotus</i>)	Fledgling						This study
	Blue-and-white Flycatcher (<i>Cyanoptila cyanomelana</i>)	Nestling						Fu et al., 1984

Appendix 1 (Continued)

Cuckoo name	Host name	Nest contents	Note contents	Cuckoo egg (g) and size (mm)	Cuckoo egg color	Host egg mass (g) and size (mm)	Host egg color	Source
Black-faced Bunting (<i>Emberiza spodocephala</i>)		Fledgling						This study
		Nestling						Fu et al., 1984
Jankowski's Bunting (<i>Emberiza jankowskii</i>)		Fledgling						This study
		Egg	IC+5H				Offwhite with brown spots	Wang et al., 2011
Azure-winged Magpie (<i>Cyanopica cyanus</i>)		Egg	IC+4H	5.4, 26.0 × 20.0	Lightcyan with brown spots	5.7, 27.4 × 19.3	Lightcyan with brown and purple spots	Zhang, 1989
		Nestling						Qian and Zhang, 1965
Himalayan Cuckoo (<i>Cuculus saturatus</i>)	Desert Finch (<i>Rhodospiza obsoleta</i>)	Egg		21.5 × 14.0	White with a few brown spots	1.0, 14.9 × 12.2	White	La Touche, 1931–34
		Egg	IC+3H	2.1, 20.6 × 13.5	White with a few brown spots	1.1, 14.4 × 11.8	White	Yang et al., 2011
		Egg		21.5 × 14.0	White with a few brown spots			White
Brownish-flanked Bush Warbler (<i>Cettia fortipes</i>)		Egg	IC+1H	2.5, 23.4 × 14.4	White with a few brown spots	1.5, 17.7 × 13.0	Chocolate	This study
		Nestling						La Touche, 1931–34
Slaty-backed Forktail (<i>Encicurus schistaceus</i>)		Egg	IC+2H	2.7, 22.8 × 14.9	White with a few brown spots	1.4, 16.4 × 13.1	Offwhite with black spots	This study
		Nestling						Fu et al., 1984
Collared Finchbill (<i>Spizixos semitorques</i>)		Egg	IC+2H	3.0, 21.2 × 16.1	White with a few brown spots	3.3, 24.6 × 17.1	Pink with violet spots	This study
		Nestling						
Oriental Cuckoo (<i>Cuculus optatus</i>)	Common Stonechat (<i>Saxicola torquata</i>)	Nestling						La Touche, 1931–34
		Egg		21.0 × 14.5	Turquoise with red spots			La Touche, 1931–34
		Egg	IC+3H	2.5, 20.7 × 14.0	White	1.1, 15.0 × 11.1	White	Wang et al., 2004

Appendix 1 (Continued)

Cuckoo name	Host name	Nest contents	Note contents	Cuckoo egg (g) and size (mm)	Cuckoo egg color	Host egg mass (g) and size (mm)	Host egg color	Source
	Pale-legged Leaf Warbler (<i>Phylloscopus tenellipes</i>)	Nestling						Fu et al., 1984
	Eastern Crowned Warbler (<i>Phylloscopus coronatus</i>)	Nestling						Gao et al., 1990
	White Wagtail (<i>Motacilla alba</i>)	Fledgling						This study
	Yellow-bellied Prinia (<i>Prinia flaviventris</i>)	Egg		21.0 × 14.7	Pink with dense red spots		Pink with dense red spots	La Touche, 1931–34
		Egg			White with brown spots		Pink with dense red spots	Zhang, 1980
	Rufous-capped Babbler (<i>Stachyris ruficeps</i>)	Egg	1C+2H		Brown		White	Lin, 2008
Lesser Cuckoo (<i>Cuculus poliocephalus</i>)	Brownish-flanked Bush Warbler (<i>Cettia fortipes</i>)	Egg	1C+3H	2.6, 22.1 × 15.2	Chocolate	1.5, 17.2 × 13.4	Chocolate	Yang et al., 2010a
		Nestling						Jiang et al., 2006
		Nestling						This study
		Nestling						This study
		Egg	1C+2H		Chocolate		Chocolate	Yang et al., 2010a
		Egg	1C+3H		Chocolate		Chocolate	Yang et al., 2010a
		Egg	1C+3H		Chocolate		Chocolate	Yang et al., 2010a
		Egg			Chocolate		Chocolate	This study
	Winter Wren (<i>Troglodytes troglodyte</i>)	Nestling						Li, 1985; Liu et al., 1988
	Blue-and-white Flycatcher (<i>Cyanoptila cyanomelana</i>)	Egg	1C+2H		Lightcyan	2.3, 20.0 × 15.0	White	Zhao, 1985; Zhao and He, 1981
	Aberrant Bush Warbler (<i>Cettia flavolivacea</i>)	Fledgling						This study
Plaintive Cuckoo (<i>Cacomantis merulinus</i>)	Common Tailorbird (<i>Orthotomus sutorius</i>)	Fledgling Egg		18.3 × 13.5	White with lightrufous spots		White with lightrufous spots	This study Vaughan and Jones, 1913

Appendix 1 (Continued)

Cuckoo name	Host name	Nest contents	Note contents	Cuckoo egg mass (g) and size (mm)	Cuckoo egg color	Host egg mass (g) and size (mm)	Host egg color	Source
		Fledgling						This study
		Nestling						This study
		Nestling						This study
		Egg	1C+3H		Palegreen with lightrufous spots		Palegreen with lightrufous spots	This study
		Egg	1C+4H		White with lightrufous spots		White with lightrufous spots	This study
		Fledgling						This study
Asian Emerald Cuckoo (<i>Chrysococcyx maculatus</i>)	Bianchi's Warbler (<i>Seiurus valentini</i>)	Nestling	1C			1.2, 15.8 × 12.0	White	Yang et al., 2008
		Egg	1C+1H	1.5, 17.2 × 12.4	White with brown spots	1.3, 15.0 × 12.3	White	This study
		Nestling	1C					This study
		Nestling	1C					This study
		Nestling	1C					This study
		Nestling	1C					This study
		Nestling	1C					This study
		Egg	1C+4H	1.3, 17.0 × 12.8	White with brown spots	0.9, 15.0 × 11.1	White	This study
Chestnut-crowned Warbler (<i>Seiurus castaneiceps</i>)		Nestling	1C					This study
Blyth's Leaf Warbler (<i>Phylloscopus reguloides</i>)		Nestling						
Buff-throated Warbler (<i>Phylloscopus subaffinis</i>)		Nestling						Li, 1985
Asian Drongo Cuckoo (<i>Surniculus lugubris</i>)	Grey-cheeked Fulvetta (<i>Alcippe morrisonia</i>)	Fledgling						This study
Asian Koel (<i>Eudynamis scolopacea</i>)	Black-collared Starling (<i>Sturnus nigricollis</i>)	Egg		33.5 × 22.9	Sage green	29.4 × 21.7	Turquoise	Vaughan and Jones, 1913
		Egg						Carey et al., 2001
	Red-billed Blue Magpie (<i>Urocissa erythrorhyncha</i>)	Nestling	1C+2H					Li, 1985
		Nestling						Lewthwaite, 1996

Appendix 1 (Continued)

Cuckoo name	Host name	Nest contents	Note contents	Cuckoo egg mass (g) and size (mm)	Cuckoo egg color	Host egg mass (g) and size (mm)	Host egg color	Source
	Black-billed Magpie (<i>Pica pica</i>)	Nestling	IC					Carey et al., 2001
		Nestling	IC					Carey et al., 2001
	Masked Laughingthrush (<i>Garrulax perspicillatus</i>)	Nestling	IC					Carey et al., 2001
Pied Cuckoo (<i>Clamator jacobinus</i>)	Unknown							
Common Hawk-cuckoo (<i>Cuculus varius</i>)	Unknown							
Hodgson's Hawk-cuckoo (<i>Cuculus nisicolor</i>)	Unknown			22.6 × 16.3	Olive brown with brown spots			Ali and Ripley, 1974
Northern Hawk-cuckoo (<i>Cuculus hyperythrus</i>)	Unknown							
Banded Bay Cuckoo (<i>Cacomantis somneratii</i>)	Unknown							
Violet Cuckoo (<i>Chrysococcyx xanthorhynchus</i>)	Unknown							

Supplementary figures



Asian Koel (*Eudynamis scolopacea*) parasitizes Black-collared Starling (*Sturnus nigricollis*), Hong Kong (Photo by G.J. Carey)



Chestnut-winged Cuckoo (*Clamator coromandus*) parasitizes Hwamei (*Garrulax canorus*), Guizhou (Photo by Chenxi Jia)



Chestnut-winged Cuckoo (*Clamator coromandus*) parasitizes Hwamei (*Garrulax canorus*), Hubei (Photo by Qiang Ma)



Large Hawk-cuckoo (*Hierococcyx sparverioides*) parasitizes White-browed Laughingthrush (*Garrulax sannio*), Guizhou (Photo by Canchao Yang)



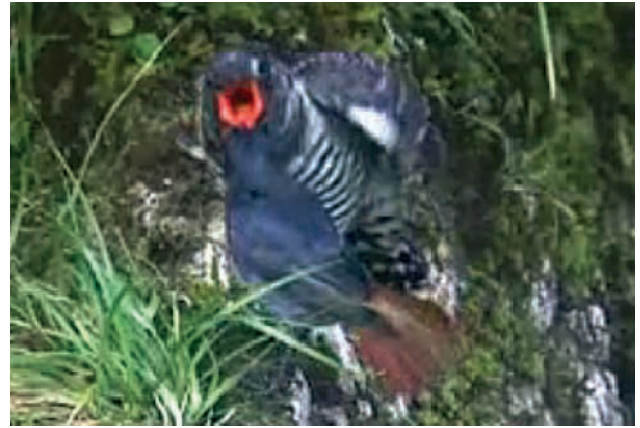
Large Hawk-cuckoo (*Hierococcyx sparverioides*) parasitizes Hwamei (*Garrulax canorus*), Guangxi (Photo by Aiwu Jiang)



Common Cuckoo (*Cuculus canorus*) parasitizes Vinous-throated Parrotbill (*Paradoxornis webbianus*), Sichuan (Photo by Ming Zhang)



Common Cuckoo (*Cuculus canorus*) parasitizes Reed Parrotbill (*Paradoxornis heudei*), Shandong (Photo by Donglai Li)



Common Cuckoo (*Cuculus canorus*) parasitizes Plumbeous Water Redstart (*Rhyacornis fuliginosus*), Jiangsu (Photo by A. Lou)



Common Cuckoo (*Cuculus canorus*) parasitizes Daurian Redstart (*Phoenicurus aureus*), Guizhou (Photo by Zhumei Li)



Common Cuckoo (*Cuculus canorus*) parasitizes Black Redstart (*Phoenicurus ochruros*), Gansu (Photo by Shuihua Chen)



Common Cuckoo (*Cuculus canorus*) parasitizes Daurian Redstart (*Phoenicurus aureus*), Guizhou (Photo by Zhumei Li)



Common Cuckoo (*Cuculus canorus*) parasitizes White Wagtail (*Motacilla alba*), Guizhou (Photo by Xiaodong Liao)



Common Cuckoo (*Cuculus saturatus*) parasitizes White Wagtail (*Motacilla alba*), Xinjiang (Photo by Ming Ma)



Common Cuckoo (*Cuculus canorus*) parasitizes Rufous-tailed Shrike (*Lanius isabellinus*), Xinjiang (Photo by Damo Gebi)



Common Cuckoo (*Cuculus canorus*) parasitizes Oriental Reed Warbler (*Acrocephalus orientalis*), Heilongjiang (Photo by Suo Tan)



Common Cuckoo (*Cuculus canorus*) parasitizes Rufous-tailed Shrike (*Lanius isabellinus*), Xinjiang (Photo by Bingchuan Yihao)



Common Cuckoo (*Cuculus canorus*) parasitizes Oriental Reed Warbler (*Acrocephalus orientalis*), Liaoning (Photo by Xiaojun Wang)



Common Cuckoo (*Cuculus canorus*) parasitizes Rufous-tailed Shrike (*Lanius isabellinus*), Shanxi (Photo by Ke Kuan)



Common Cuckoo (*Cuculus canorus*) parasitizes Grey-backed Shrike (*Lanius tephronotus*), Chongqing (Photo by Kacha Chongqing)



Common Cuckoo (*Cuculus canorus*) parasitizes Grey Bushchat (*Saxicola ferrea*), Guizhou (Photo by Canchao Yang)



Common Cuckoo (*Cuculus canorus*) parasitizes Brown Shrike (*Lanius cristatus*), Beijing (Photo by Sdm)



Common Cuckoo (*Cuculus canorus*) parasitizes Richard's Pipit (*Anthus richardi*), Qinghai (Photo by Suixing Tian)



Common Cuckoo (*Cuculus canorus*) parasitizes Brown Shrike (*Lanius cristatus*), Henan (Photo by Laogao Dongzhai)



Common Cuckoo (*Cuculus canorus*) parasitizes Black-faced Bunting (*Emberiza spodocephala*), Qinghai (Photo by Cao Ting)



Common Cuckoo (*Cuculus canorus*) parasitizes Jankowski's Bunting (*Emberiza jankowskii*), Heilongjiang (Photo by Jun Zhao)



Lesser Cuckoo (*Cuculus poliocephalus*) parasitizes Aberrant Bush Warbler (*Cettia flavolivacea*), Gansu (Photo by Suixing Tian)



Common Cuckoo (*Cuculus canorus*) parasitizes Common Stonechat (*Saxicola torquata*), Guizhou (Photo by Hao Ai)



Plaintive Cuckoo (*Cacomantis merulinus*) parasitizes Common Tailorbird (*Orthotomus sutorius*), Guangdong (Photo by Zga)



Common Cuckoo (*Cuculus canorus*) parasitizes White-bellied Redstart (*Hodgsonius phaenicuroides*), Tibet (Photo by Xin Lu)



Plaintive Cuckoo (*Cacomantis merulinus*) parasitizes Common Tailorbird (*Orthotomus sutorius*), Guangdong (Photo by Lool)



Plaintive Cuckoo (*Cacomantis merulinus*) parasitizes Common Tailorbird (*Orthotomus sutorius*), Guangxi (Photo by Cainiao Zishen)



Drongo Cuckoo (*Surniculus lugubris*) parasitizes Grey-cheeked Fulvetta (*Alcippe morrisonia*), Fujian (Photo by Xiaogang Da)