

First Documented Nesting of the Red-Whiskered Bulbul *Pycnonotus jocosus* in Taiwan

紅耳鶇(*Pycnonotus jocosus*)在臺灣的首次繁殖報告

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Abstract

The red-whiskered bulbul *Pycnonotus jocosus* is widely distributed across south-east Asia but does not occur naturally in Taiwan. Recent evidence suggests that it may be in the process of establishing itself in Taiwan with breeding evidence reported from two localities in Taipei City. This paper reviews the observational records of the red-whiskered bulbul sightings in Taiwan since 1985, and then reports its first documented nesting attempt in May 2010. Furthermore, the incubation period, nestling period, breeding dates and predation of red-whiskered bulbul nestlings in the literature were briefly reviewed. The likelihood and possible consequences of a successful establishment of the red-whiskered bulbul in Taiwan were discussed, ending with a short summary of the number of exotic bird species that have been recorded and bred in the wild in Taiwan.

摘要

紅耳鶇(*Pycnonotus jocosus*)廣泛分布於東南亞，但並不自然分布於台灣。然而，由近年於台北市 2 個不同地點的野外繁殖紀錄，顯示其於台灣可能正處於建立族群的過程中。本文審視 1985 年後紅耳鶇於台灣的觀察紀錄，及首次詳細報導 2010 年 5 月紅耳鶇於野外的 1 次繁殖嘗試。本文亦回顧紅耳鶇的孵蛋期、育雛期、繁殖日期及可能的鳥巢天敵，並討論紅耳鶇於台灣建立族群的可能性，以及其後續可能衍生的影響。

Key words: invasive species, nesting, red-whiskered bulbul *Pycnonotus jocosus*, Taiwan

關鍵詞：入侵種、外來種、築巢、紅耳鶇、台灣

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Introduction

The red-whiskered bulbul *Pycnonotus jocosus* is widespread throughout the central and eastern parts of the sub-Indian continent and south-east Asia, but does not naturally occur in Taiwan. Within its distributional range, it is relatively common in areas at elevations below 2,000m, which are nowadays mostly anthropogenic landscapes, such as secondary scrub, roadsides, parklands, orchards, urban and suburban gardens and parks, but also more open natural habitats, such as dense hilly woodlands, reed beds, and edges of forests and mangroves, where the red-whiskered bulbul opportunistically feeds mostly on fruits but also on flower buds, nectar, invertebrates and even kitchen waste. Because of its wide distributional range and consequently large global abundance, it is not globally threatened, though it has been almost or entirely extirpated over

substantial parts of its range due to hunting and trapping (Fishpool and Tobias 2005).

Methods and Results

Field work was carried out with the help of Leica 7 x 42 BA binoculars, a stopwatch, and a Canon EOS camera. A literature search was conducted through the internet, especially the Web of Science, but also Google.

Previous observations

In Taiwan the red-whiskered bulbul is sold in pet stores because it is a popular cage bird and may also be released during religious ceremonies, the so-called 'prayer animal release' (Severinghaus and Chi 1999; Shieh *et al.* 2006; Agoramoorthy and Hsu 2007; Shiu and Stokes 2008). In the wild the first individual was recorded on 2 June 1985 in Feicuigu, Shiding Township, Taipei County.

Since then, the number of observations increased until 1999 and then decreased again, either because reporting decreased or because red-whiskered bulbuls actually decreased, as ascertained by I. Y. Chen (see below). Observations were made during all months of the year, mostly in Taipei City and Taipei County (169 observations (90%) out of a total of 188 observations). The remaining observations were made at 10 locations in Kaohsiung City, and Nantou, Taichung, Tainan and Taoyuan Counties (Table 1).

The highest number of observations at one location was 59 made along Zhuhai Road, Beitou District, Taipei, from 1999 to 2004. This district was also the only district in Taiwan of having more than five individuals observed at a single occasion; the highest was 20 individuals on 19 November 1999. According to B. S. Shieh (personal communication 2010), young birds were observed during this period in Quanyuan Park which runs along Zhuhai Road. As a result, Shieh *et al.* (2006) listed the red-whiskered bulbul as breeding in the wild in Taiwan.

However, I was able to contact the original observer of the above records, I. Y. Chen (personal communication 2011), who provided me with the following details: In 1999, there were up to 20 individuals moving in one to three groups in an area of several hectares of gardens and scrubs covering a mountainside north of the local river and around Cihui Temple at the upper end of Zhuhai Road. Very rarely (<10% of observations) were individuals observed away from this core area. They were regularly found and often roosted overnight in large trees along the river, and fed from the following plant species: *Acacia confusa*, *Bischofia javanica*, *Broussonetia papyrifera*, *Cerbera manghas*, *Cinnamomum camphora*, *Cyclo-*

balanopsis glauca, *Ficus microcarpa*, *Ficus superba*, *Hibiscus taiwanensis*, *Hibiscus tiliaceus*, *Koelreuteria henryi*, *Liquidambar formosana*, *Macaranga tanarius*, *Machilus thunbergii*, *Mallotus paniculatus*, *Miscanthus floridulus*, *Morus australis*, *Prunus campanulata*, *Sapindus mukorossii*, *Sapium sebiferum*, *Schefflera octophylla*, *Terminalia catappa*, *Trema orientalis* and *Ulmus parvifolia*. Contrary to Shieh *et al.* (2006), I. Y. Chen did not observe any breeding attempts or young birds.

When coming into contact with black drongos *Dicrurus macrocercus*, black bulbuls *Hypsipetes leucocephalus* or Chinese bulbuls *Pycnonotus sinensis*, the red-whiskered bulbuls called and puffed out their feathers, but invariably retreated to avoid physical attack. Over several years, the number of individuals gradually decreased until all individuals disappeared from the area, despite repeated searches being made in the wider surroundings of Quanyuan Park. I also did not observe any red-whiskered bulbuls in and around Quanyuan Park on 25 October 2010 and 22 January 2011.

First breeding record

On 5 November 2009, I first encountered two adult red-whiskered bulbuls sitting side by side on a telephone wire (25°01'04.1"N, 121°33'47.9"E ± 8m, measured with *GARMIN GPSmap 60CSx*) going across the cemetery just below the Ling-an Tower of the Congde Temple, Taipei (Fig. 1). All subsequent observations were made at this location, whereby the two adults were never spotted farther than 100m from and usually within a 50m radius of their favourite outlook perch on the wire (distances determined using GPS coordinates and www.gpsvisualizer.com/calculators).

Table 1. Summary of 188 observations of red-whiskered bulbuls from the wild in Taiwan and registered in the database of the Chinese Wild Bird Federation up to 1 October 2010 and from this study

Year	Months	Number of observations	Range of observed individuals	Locations
1985	6	1	1	Feicuigu, New Taipei City (新北市翡翠谷)
1987	2, 3, 11	4	1-2	Botanical Garden, Taipei City (台北市植物園)
1988	2	1	1	Botanical Garden, Taipei City (台北市植物園)
1992	1	1	1	Botanical Garden, Taipei City (台北市植物園)
1993	6	1	2	Botanical Garden, Taipei City (台北市植物園)
1995	1, 2	2	2	Botanical Garden, Taipei City (台北市植物園)
1996	1-5, 7	11	1-5	Botanical Garden, Taipei City (台北市植物園)
1997	2, 4-6, 8, 10, 12	17	1-4	Botanical Garden, Taipei City (台北市植物園); Luliao, Tainan City (台南市白河鹿寮); Yeliu, New Taipei City (新北市野柳)
1998	2-3, 9, 11, 12	7	1-4	Botanical Garden and Huajiang Bridge, Taipei City (台北市植物園及華江橋); Luliao, Tainan City (台南市白河鹿寮)
1999	1, 2, 4, 5, 7-12	44	1-4, 6-10, 12-13, 15, 20	Botanical Garden, Guangzhou Street, Huajiang Bridge, Zhuhai Road, all in Taipei City (台北市植物園、廣州街、華江橋、珠海路); Yeliu, New Taipei City (新北市野柳)
2000	1-12	35	1-4, 6	Botanical Garden, Huajiang Bridge, National Taiwan University, Yangmingshan, Zhongzhengshan, Zhuhai Road, all in Taipei City (台北市植物園、華江橋、台灣大學、陽明山、中正山、珠海路); Liyutan, Nantou County (南投縣埔里鯉魚潭); Luliao, Tainan City (台南市白河鹿寮)
2001	1-5, 7-10, 12	20	1-3	Huajiang Bridge and Zhuhai Road, Taipei City (台北市華江橋及珠海路); Zhitan, New Taipei City (新北市直潭); Chaishan, Kaohsiung City (高雄市柴山); Shimen Reservoir, Taoyuan County (桃園縣石門水庫); Sicao, Tainan City (台南市四草)
2002	1, 3, 6, 10, 11	9	1-2, 7	Guandu, Huajiang Bridge, Zhuhai Road, all in Taipei City (台北市關渡、華江橋、珠海路); Sun Moon Lake, Nantou County (南投縣日月潭)
2003	2, 5, 9	5	1-2	Guandu and Zhuhai Road, Taipei City (台北市關渡、珠海路)
2004	3, 4, 6, 7	7	1-2	Guandu and Zhuhai Road, Taipei City (台北市關渡、珠海路); Nihu, Nantou County (南投縣竹山牛湖)
2005	3, 4, 6, 10	6	1-2	National Taiwan University, Taipei City (台北市台灣大學); Jinmin, New Taipei City (新北市三峽金敏); Chaishan, Kaohsiung City (高雄市柴山); Shitoupu, Nantou County (南投縣埔里石頭埔); Toubiankeng, Taichung City (台中市太平頭汴坑)
2006	2, 5, 8	3	1-2	Kuei-Tzu-Keng, Pei-Tou and National Taiwan University, Taipei City (台北市貴子坑、北投、台灣大學); Wazaiwei, New Taipei City (新北市挖仔尾)
2007	3-5	3	1, 3	Sikanshui and Qingshui, New Taipei City (新北市新店四崁水、土城清水); Chaishan, Kaohsiung City (高雄柴山)
2008	8	1	1	Bitang, New Taipei City (新北市碧潭)
2009	1, 3, 11	3	1-2	Sun Moon Lake and Yanshan, Nantou County (南投日月潭、竹山延山); Congde Temple, Taipei City (台北市崇德寺)
2010	3, 5	7	2, 4*	Congde Temple, Taipei City (台北市崇德寺)

* This number refers to the two adults and two nestlings described in this study.



Fig. 1. The cemetery photographed on 13 May 2010 (the white Ling-an Tower (崇德寺, 靈安塔) at $25^{\circ}01'02.3''\text{N}$, $121^{\circ}33'49.0''\text{E}$ belongs to the Congde Temple, opposite off 297 Congde Street (崇德街 297 號對面), Taipei City). The right tree in the middle of the inlet photo whose location is indicated by the arrow contained the nest of the red-whiskered bulbul at $25^{\circ}01'04.1''\text{N}$, $121^{\circ}33'49.0''\text{E}$.

The presumably same two adults were again observed on 6 and 28 March 2010 (all dates from hereon refer to 2010). On the latter occasion, both adults groomed for about 2 min while perched on the wire before one adult approached two Chinese bulbuls sitting on the same wire by hopping closer and closer, several times changing directions, when alighting onto the wire. This behaviour, perhaps to impress the partner, was also observed by Carleton and Owre (1975) during breeding times of the red-whiskered bulbul.

On 9 May at 17:39 hours, one of the adults began grooming for about 10 min on the wire. It mostly looked out from the wire during the next 10 min. During the next four min, it moved from the top of a bush to a cemetery wall to a small statue before swiftly disappearing into a two-metre high tree at 18:03 hours (Fig. 1). I then scared the adult off its nest which was at about 1.9m height within the dense crown of the tree, attached to small branches and only partly hidden by vegetation (Fig. 2). The nest contained three



Fig. 2. Two-metre tall tree which contained the nest of the red-whiskered bulbul (top inlet photo showing a close-up of the abandoned nest; bottom inlet photo showing a close-up of the breeding adult whose top of the head is visible in the middle of the photo, with the beak pointing left; all photos taken on 13 May 2010).

eggs, white in colour with a purplish hue and medium to dark purple and bluish blotches concentrated on the obtuse end (Fig. 3). During this and subsequent visits, one or both adults invariably moved to a nearby spot, usually the wire, and repeatedly called, e.g., a repeated *chir-drrr*, with the second syllable being lower.

I revisited the nest on 13, 15 and 19 May,

always late in the afternoon, to photograph the nestlings and egg (Figs. 4-7). On 13 May the nestlings were still naked with closed eyes (Fig. 4), a condition which Carleton and Owre (1975) refer to as *psilopaedic*. Van Riper *et al.* (1979) observed that the nestlings were naked at hatching, had pin feathers and closed eyes at 3 days old, were fully feathered at 10 days old and fledged

after 12 days. Therefore, these nestlings were probably about 1-2 days old because they did not even have pin feathers (Fig. 4). On 15 May the nestlings' eyes were still closed, and they were mostly naked with emerging feather quills only showing on the wings and down the spine (Fig. 5). On 19 May I collected the egg (Fig. 3) as it was apparently infertile. The nestlings had opened their eyes, and they had feather quills covering most of their bodies (Figs. 6 and 7). On 21 May at 17:40 hours, the two adults sat on a nearby bush, but the absence of any alarmed scolding

despite my approach was confirmed when the nest was found empty. Many small down feathers and a few contour feathers in the nest and the surrounding vegetation pointed towards a previous struggle. On 1 June with no adults around anymore, I also collected the nest which was a small open cup made of grasses, herbs, a few green leaves, and few pieces of paper weighing about 5 grams after extensive drying. Its external dimensions were 130 x 110 mm horizontally and 60 mm vertically, and its internal dimensions were 70 x 50 mm horizontally and 30 mm vertically (Fig. 8).



Fig. 3. The egg (length 19 mm, width 15 mm) collected from the red-whiskered bulbul nest on 19 May 2010.



Fig. 4. An egg and two nestlings (about 32 mm long measured from bodily bottom to point between beak and skull) of red-whiskered bulbul photographed on 13 May 2010.



Fig. 5. An egg and two nestlings (about 45 mm long measured from bodily bottom to point between beak and skull) of red-whiskered bulbul photographed on 15 May 2010.



Fig. 6. Nestlings (about 65 mm long measured from bodily bottom to point between beak and skull) of red-whiskered bulbul photographed on 19 May 2010.



Fig. 7. The larger nestling of red-whiskered bulbul and a close-up of its face photographed on 19 May 2010.



Fig. 8. The nest collected on 1 June 2010 (black bar, 20 mm).

Discussion

Comparison with previous published literature

The placement, materials, dimensions and clutch size of the nest observed in this study accorded very much with those of wild populations reported by Fishpool and Tobias (2005), and adult behaviours around the nest were similar to those reported by Carleton and Owre (1975).

The previously reported incubation and nestling periods are 11-14 and 12-14 days, respectively (Van Riper *et al.* 1979; Fishpool and Tobias 2005). Given their size and appearance, the nestlings of this study fledged between 9 and 13 May and most likely on 11-12 May, and were presumably predated between 19-21 May. Therefore, this breeding date fits perfectly well with those of wild populations that were reported as April-May in the Andamans and northern Thailand, February-July in Peninsular Malaysia, and March-October in northern India and December-May in southern India (Fishpool and Tobias 2005).

Fishpool and Tobias (2005) reported that “because bulbul nests are large and poorly concealed, and partly because adult birds are not particularly circumspect in their vicinity, they seem to suffer inordinately high predation rates.” In most studies of pycnonotids, only 10% of eggs produce fledglings, with typical predators being corvids, lizards, snakes and monkeys. Accordingly, heavy predation was reported for the red-whiskered bulbul (Fishpool and Tobias 2005). Almost certainly, the nest observed in this study was also predated, as the large number of downy feathers found around the nest point towards a struggle of the adults with a predator. The Taiwan Macaque *Macaca cyclopis* is an important nest predator in Taiwan, but it was not present at this site, while Taiwanese lizards

are not nest predators due to their small size. Possible predators present at the site were the grey treepie *Dendrocitta formosae* and the black-billed magpie *Pica Pica*. The crested goshawk *Accipiter trivirgatus* and snakes were also possible nest predators, as were feral cats which were very abundant in Taipei due to some people regularly feeding them, sometimes on a daily basis, and which were regularly seen in the vicinity of the nest.

Likelihood of successful establishment

Blackburn *et al.* (2009) pointed out that, for a successful invasion to happen, a species must pass several invasive stages: transport, release, and establishment. Red-whiskered bulbuls are sold in Taiwan as cage birds, and individuals must escape or be released as the observations in the wild demonstrate (Table 1). This documented nesting attempt indicates that the red-whiskered bulbul may now be in the process of establishing itself in Taiwan. However, several studies (cited in Blackburn *et al.* 2009) showed that propagate pressure (which combines the number of introduction events and the number of individuals per introduction) is positively related to establishment success. These studies also indicated that introductions of fewer than 20 individuals will very likely be unsuccessful. In the case of the red-whiskered bulbul, it may be safely assumed that both introduction events and the number of individuals per introduction are most likely to be very low in Taiwan, with just one or a few individuals escaping or being released during each event. Given the consistently high predation rate on bulbul nests, as confirmed in this study, the likelihood of establishment seems rather low, though Clergeau and Mandon-Dalger (2001) reported that only 2-6 pairs were needed for successful establishment in several locations.

This observation and the availability of large and suitable anthropogenic landscapes which could be invaded by the red-whiskered bulbul count in its favour. Once established it can colonize an entire island, such as the 2,515 km² island of Réunion, within a few decades (Clergeau and Mandon-Dalger 2001). Therefore, the red-whiskered bulbul should be included in monitoring programs, observers should watch out for signs of breeding, and individuals should be destroyed if the species is deemed a potential menace for the native biota.

Possible impacts of establishment

The red-whiskered bulbul has managed to establish itself in several other locations, for example, in the Arabian peninsula, Mauritius, Réunion, Comoros, Nicobars, Seychelles, Malaysia, Singapore, Borneo, Java, Sumatra, Hong Kong, Japan, eastern Australia, Hawaii, California and Florida (Barré *et al.* 1996; Mandon-Dalger *et al.* 1999; Clergeau and Mandon-Dalger 2001; Chan 2004; Eguchi and Amamo 2004; Leven and Corlett 2004; Yap and Sodhi 2004; Lever 2005; Fishpool and Tobias 2005). In some regions, it is considered a pest species mostly of fruits and vegetables, but it has both beneficial and harmful impacts on agriculture (Long 1981; Clergeau and Mandon-Dalger 2001; Yap and Sodhi 2004; Lever 2005). Because of its mostly frugivorous habit, the red-whiskered bulbul is also an important seed disperser of native and exotic plant species (Carleton and Owre 1975; Clergeau and Mandon-Dalger 2001; Leven and Corlett 2004). It sometimes predated native eggs, nestlings and arthropods (Barré *et al.* 1996; Clergeau and Mandon-Dalger 2001; Lever 2005) and may act as a reservoir of avian malaria in Hawaii (Lever 2005).

The red-whiskered bulbul can also be aggressive

towards native bird species (Eguchi and Amano 2004). Upon its establishment in the Nicobars, it has become so abundant that it may be replacing sparrows and the formerly common endemic Nicobar bulbul *Ixos nicobariensis* which is now threatened (Fishpool and Tobias 2005). In the Mascarenes Islands, the red-whiskered bulbul may be negatively affecting several endemic and endangered species, such as the Mauritius bulbul *Hypsipetes olivaceus*, the Mauritius cuckoo-shrike *Coracina typica*, the Mauritius kestrel *Falco punctatus* and the pink pigeon *Nesoenas mayeri* (Jones 1996; Lever 2005). On Mauritius, the red-whiskered bulbul competes for food with two endangered endemic species (Lever 2005). Moreover, methods used by farmers to limit red-whiskered bulbuls, e.g., bird lime and pesticides, may also impact endemic birds (Clergeau and Mandon-Dalger 2001).

Despite being rather similar in behaviours, Chan (2004) found that the red-whiskered bulbul has largely displaced the Chinese bulbul in Hong Kong's suburban areas but not in more rural, semi-natural and natural habitats since the red-whiskered bulbul's introduction many decades ago, before which the Chinese bulbul was abundant everywhere. Given Chan's (2004) study and the seemingly aggressive behaviour of the red-whiskered bulbul towards the Chinese bulbul observed in Taipei (see above), the red-whiskered bulbul could potentially displace the abundant Chinese bulbul as well as the much less abundant and endemic Taiwan bulbul *Pycnonotus taivanus*, at least in the anthropogenic landscapes of Taiwan.

Because of its demonstrated potential to displace native birds and disperse non-native plants, the red-whiskered bulbul may not be imported into Tasmania (Anonymous 2010). While

an import stop of the red-whiskered bulbul as well as for many other exotic bird species is unlikely to be implemented any time soon in Taiwan, because of their widespread popularity as cagebirds, all the aforementioned examples reinforce the potential threat of the red-whiskered bulbul's establishment into a novel environment, such as Taiwan. Clergeau and Mandon-Dalger (2001) estimated that the successful eradication of this species is only possible within the first 3-5 years after establishment, a date which may already have passed for Taiwan (Table 1).

Increase of exotic birds in Taiwan

Because of the large numbers of exotic birds entering Taiwan through the bird trade, many of which escape or are being released, Taiwan has seen a steady increase in both the number of exotic bird species that have been observed and that have established themselves in the wild. Severinghaus and Chi (1999) reported that 68 species of exotic bird species were recorded and 16 species had bred in the wild in Taiwan since 1995. Only a few years later, this number had increased to 75 species having been recorded and 18 species having been established (Agoramoorthy and Hsu 2007), while another study reported 28 established species (Shieh *et al.* 2006). The most recent enumerations listed 32 (Brazil 2009) and 39 established species (M. W. Fan, In prep.). This rather rapid increase in exotic bird species should be of concern to Taiwanese conservationists and policy-makers. With increased educational efforts and publicity, perhaps national sentiments towards importing exotic birds can be reversed.

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