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Original Article

Trade in a small-range songbird, the Javan crocias, gives insight into the Asian Songbird Crisis



Vincent Nijman^{a,*}, Ahmad Ardiansyah^{b,c}, Rifqi Hendrik^b, Abdullah Langgeng^{b,d}, Sophie Manson^b, Katey Hedger^b, Muhammad Ali Imron^e, K. Anne-Isola Nekaris^{a,b}

^a Oxford Wildlife Trade Research Group, Oxford Brookes University, Oxford, UK

^b Little Fireface Project, Cipangati, Indonesia

^c Forest and Nature Conservation Policy Group, Wageningen University, Wageningen, the Netherlands

^d Primate Research Institute, Kyoto University, Kyoto, Japan

^e Forest Resource Conservation, Universitas Gadjah Mada, Yogyakarta, Indonesia

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ABSTRACT

The Asian Songbird Crisis—the recognition that the cage bird trade is the number one threat to many songbirds—has focussed on either individual bird markets or specific taxa. We here show, through sustained monitoring, that even species that were not thought to be traded are also at risk from over-exploitation. The Javan crocias *Laniellus albonotatus* is endemic to the montane forests of western Java—this remoteness was thought to be the reason why it had escaped from being at risk. We surveyed 21 bird markets over a 44-month period; the number of crocias recorded in markets (1.29 birds/survey) was negatively related to the distance to its habitat. The size of the bird market had no effect on the number of crocias we recorded. Prices (US\$26.70/bird), when corrected for inflation, did not change over 12 years suggesting supply can keep up with demand. Turnover is high (50% sold after 8 days), and we estimate the total trade at 1,200 to 1,500 birds/year. Legal protection of Javan crocias seen in isolation thus far is proven to be ineffective. A more inclusive approach where government bodies, conservation agencies and society participate, is needed to curb the trade in this and other imperiled songbirds.

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Introduction

The insatiable demand for cage birds in Indonesia and other parts of Asia has led to what has been termed the Asian Songbird Crisis (Eaton et al 2016; Owen et al 2014; Sykes 2017). While large-scale capturing and trade in songbirds has been ongoing since at least the 1960s, it is now clear that this trade is a major impediment for the survival of many bird species (e.g. Collar et al 2012; Eaton et al 2016; Harris et al 2015; Nijman et al 2009, 2017; Nijman and Nekaris 2017; Shepherd 2011; Shepherd et al 2016, 2020). The trade is most pronounced on the Indonesian island of Java (Jepson and Ladle 2005, 2009; Marshall et al 2020; Nash 1993). Songbirds are openly traded in bird markets (*pasar burung*) or animal markets (*pasar hewan*) that are found in many of the larger cities on these

islands. The number of birds traded in these markets is staggering, with for instance Chng et al (2015) recording 16,171 largely wild-caught birds of 190 species during a single visit to the Pramuka bird market in Jakarta in 2015. Increasing human populations, with a growing middle class with disposable income, weak governance and rampant corruption, low compliance with bird protection laws and bird trade regulations, and a society where keeping wild, rare, and protected birds does not carry a social stigma, hamper effective bird conservation in Indonesia (Nijman et al 2018). Hitherto the focus on many recent bird market studies has been on the globally threatened or otherwise rare species (e.g. Krishna et al 2019; Bali myna *Leucopsar rothschildi*: Jepson 2016; black-winged myna *Acridotheres melanopterus*: Nijman et al 2018; strawheaded bulbul *Pycnonotus zeylanicus*: Bergin et al 2018), those taxa that are traded in large numbers (parrots in Indonesia: Setiyani and Ahmadi 2020; white-rumped shama *Kittacincla malabarica* and Chinese hwamei *Garrulax canorus* traded throughout Southeast Asia: Leupen et al 2018; Shepherd et al 2020) or ones that have seen an increase in trade in recent years (e.g. owls in Indonesia: Nijman and Nekaris 2017; parrots in Singapore: Aloysius et al 2020). We here focus

* Corresponding author.

E-mail address: vnijman@brookes.ac.uk (V. Nijman).

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on a little-known small-range songbird, that while protected is traded illicitly and that has received little attention from the conservation community.

The Javan crocias *Laniellus albonotatus* (formerly *Crocias albonotatus*, also known as spotted crocias) is endemic to the montane forest of westernmost part of the Indonesian island of Java, where it has been recorded in only a few of the highest mountains, including Mts Halimun-Salak, Mts Gede-Pangrango, Mt Papandayan, and Mt Ciremay (Husodo et al 2020; Mittermeier et al 2014; Prawiridilaga 2017; Stresemann 1930). It has not been recorded in Central or East Java. Its main habitat is tropical montane cloud forest (Long 1995) mainly above 1,400 m asl and up to around 2,500 m asl (Mittermeier et al 2014; V. Nijman, pers. observ.). It is listed as Near-Threatened according to IUCN Red List criteria (BirdLife International 2017) because while its range is highly restricted, much of its habitat remains secure by virtue of its inaccessibility, and the species is experiencing only a suspected slow decline.

While Birdlife International (2017) suspected trapping in the lower parts of its elevational range, they highlighted that no Javan crocias had been seen recently in the Indonesian bird markets. Javan crocias was included on Indonesia's protected species list in 1979 prohibiting the buying and selling, as well as the keeping of the species. Lawbreakers can be fined US\$7,000 and/or receive a custodial sentence of up to five years. However, it has been well documented that these protected species laws are rarely enforced even for the most high-profile of species (e.g. orang-utans: Nijman 2017) and many protected species are openly offered for sale in bird markets.

The scant data there is on the trade in Javan crocias suggest that their numbers in the bird markets have always been small. In the 1990s and early 2000s occasionally the species was recorded in the bird markets of Jakarta and Bogor in western Java both within the species distribution range (V. Nijman, pers. observ.) but rarely more than one bird was observed at a time. In 2008, Haryoko (2010) recorded one individual in a bird market in Garut as part of a survey of three bird markets in West Java during which he recorded 2,080 birds. Profaua (2009) surveyed 70 bird markets for protected species but did not record any Javan crocias among the 151 protected birds they observed. Mittermeier et al (2014) remarked that they observed the species in one or more bird markets on Java in 2013 but do not give specifics. Chng et al.'s (2015) inventory of Jakarta's three bird markets list seven Javan crocias among the more than 19,000 birds recorded. Chng and Eaton (2015) recorded none in a survey of five bird markets in central and eastern Java, outside the species' natural range, but Chng et al (2016) recorded one Javan crocias in Bandung, within the species' distribution range. Marshall et al (2020) did not record any amongst the almost 6,000 cage birds that were recorded as part of a household survey in Java in 2018, and likewise Iskandar et al (2020) did not record any during their work in the bird market in Yogyakarta. Leupen and Shepherd (2018) recorded four Javan crocias in Jakarta, one in Yogyakarta, and none in five other cities. Combined, these data suggest that just over a dozen birds have been recorded in bird markets in three cities over the last decade or so; all but one bird was recorded within the species' distribution range.

We here show that the trade in Javan crocias is substantially larger than these aforementioned studies suggest, both in terms of the number of individuals that are offered for sale and the number of cities in where the species is available. We hypothesize that if the number of birds we observe in the bird markets is related to bird market characteristics (more birds in larger bird markets; less birds in markets outside the distributional range of the species; a negative relationship between the number of birds in a market and the distance to the natural habitat of Javan crocias) and seasonality (fewer birds during the rainy season). We further hypothesize that

as the population of Javan crocias is declining (BirdLife International 2017), and birds get rarer and more difficult to obtain, over time the asking prices will increase above levels of inflation (Courcampes et al 2006).

Material and methods

Data acquisition

We conducted bird market surveys throughout Java. In the bird market, all species were identified, and numbers were counted; the trade in songbirds is open in these markets, and there is no need to resort to undercover techniques. For this study, we only include bird markets that we have surveyed at least three times over the period August 2016 to March 2020 (hereafter surveying was made more challenging due to COVID-19). As such we surveyed 21 bird markets, four in the capital district of Jakarta, nine in the province of West Java, four in Central Java, two in East Java and one in the special district of Yogyakarta. The total number of surveys was 128. All surveys were at least one month apart, other than the ones in Garut regency (see below) that were surveyed more frequently, but for analysis we only included the first survey of the month.

In June 2019, March 2020, and December 2020, we searched online for Javan crocias for sale using their Indonesian names (*pentet matahari* and *cica matahari*) in combination with for sale (root: *jual*). In addition, again using its Indonesian names, we searched on the online market platforms Shopee.co.id, Kaskus.co.id, Jualo.com and Indonesian Facebook pages that sell specific songbirds. In addition, using a similar approach, we searched for evidence of Javan crocias being seized by the authorities and of successful prosecution of Javan crocias trappers, sellers, or keepers.

Analysis

For each bird market, we calculated the mean number of birds that were present when we recorded the species, we noted the maximum number of birds that was present at any of these surveys. To explain the variation in both the mean number of Javan crocias for sale and the maximum number of crocias, we tested for the following correlates:

1. Size of the bird market (large, more than 30 and up to 200 shops or stalls; small, 30 shops or less)
2. Distribution range (bird markets present within the range of the Javan crocias, i.e. west of the line running between the cities of Cirebon and Tasikmalaya; bird markets outside the range, i.e. in Central and East Java, or Yogyakarta)
3. Straight-line distance between the bird market and the nearest available habitat (i.e. montane forest within the species' range).
4. Annual rainfall and seasonality. While large parts of the distribution range of the Javan crocias is everwet (with in each month >100 mm of rainfall), we tested for seasonality by comparing monthly numbers of Javan crocias we observed in all bird markets combined for the wettest period (October-January, mean rainfall in Garut, in the center of the species' distribution range, ~240 mm/month), an intermediate period (February–May, ~190 mm/month), and a less wet period (June–September, ~140 mm/month).

The three bird markets in Garut regency (Kerkhof, Mawar and Bajongbong) were visited more frequently than the other bird markets, often on a weekly or fortnightly basis. This allowed us to calculate turnover of Javan crocias, i.e. how long it takes to sell 50% or 75% of the birds on display. We assume that the data from Garut are representative for the other bird markets.

Prices were corrected for inflation to January 2020 and then converted to US\$, and data were log-transformed to approach a normal distribution more closely. We used Pearson's R to test for correlations between the mean and maximum number of birds that were observed in individual bird markets, and survey effort (i.e. the number of visits to individual markets). Pearson's R was also used to test for numbers of birds in bird markets and distance to natural forest. We used t-tests to test for differences in mean and maximum number of birds we observed in small and large bird markets and within and outside the species' natural range. We accept statistical significance when $P < 0.05$ in a two-tailed test.

Results

Trade in bird markets

We recorded 216 Javan crocias for sale in 16 bird markets during 126 surveys; 12 of these bird markets were within the species' natural range and 4 were outside (Figure 1A). In five bird markets, we did not record the species, three outside, and two within the species' natural range.

Mostly, single birds were observed and the mean per market was just over one bird (Figure 1B). The largest number we observed in one market at a time was twenty birds in Pramuka bird market in Jakarta, nine birds in Kerkhof bird market in Garut, and five birds in Sukahaji bird market in Bandung; all these bird markets are within the range of the Javan crocias. In those markets where the species was recorded, there was a strong positive correlation between the mean and maximum number of birds that were observed (Pearson's $R = 0.872$, $R^2 = 0.760$, $P = 0.00002$). As expected, there was a positive relationship between survey effort and the maximum number of birds that was recorded during the surveys ($R = 0.526$, $R^2 = 0.277$, $P = 0.014$), i.e. when a bird market is visited more frequently the maximum number of birds that is recorded increases. There was no relationship between survey effort and the

mean number of birds recorded in individual bird markets ($R = 0.309$, $R^2 = 0.095$, $P = 0.1736$).

There was no statistically significant difference between the mean and maximum number of birds for sale between large and small markets (mean: 1.65 ± 2.24 birds/market vs 1.07 ± 0.907 birds/market: t -test = 0.836, $P = 0.413$; maximum: 4.38 ± 6.57 birds/market vs 2.00 ± 2.48 birds/market: $t = 1.188$, $P = 0.2493$).

The mean, but not the maximum, number of birds that were on offer in bird markets within the species' natural range was higher than that in bird markets outside this range (mean: 1.76 ± 1.68 birds/market vs 0.37 ± 0.45 birds/market: $t = 2.114$, $P = 0.048$; maximum: 4.00 ± 5.19 birds/market vs 0.71 ± 0.76 birds/market: $t = 1.645$, $P = 0.116$).

Considering all bird markets, there was a negative relationship between the shortest geographic distance to the species' natural habitat and mean number of birds recorded in the market ($R = -0.448$, $R^2 = 0.201$, $P = 0.042$). This was largely driven by bird markets outside the species natural range as when we excluded those, we no longer found any relationship between mean number of birds for sale and geographic distance ($R = -0.015$, $R^2 = 0.002$, $P = 0.957$) (Figure 1D).

We found a clear seasonality in the numbers of Javan crocias we observed in the bird markets (Figure 1C). The smaller numbers were observed during the wettest period (12.00 ± 1.41 birds/month), followed by the least wet period (16.75 ± 3.59 birds/month) and the highest were recorded during the transitional period (25.25 ± 3.68 birds/month). Only the difference between the wettest and the intermediate period were significantly different ($t = 3.359$, $P = 0.015$).

Online trade and monetary value

We found twelve ads offering a total of fifteen Javan crocias for sale (Figure 2A), the first one dating back to April 2008 and the most recent one in November 2020, with most of them posted in

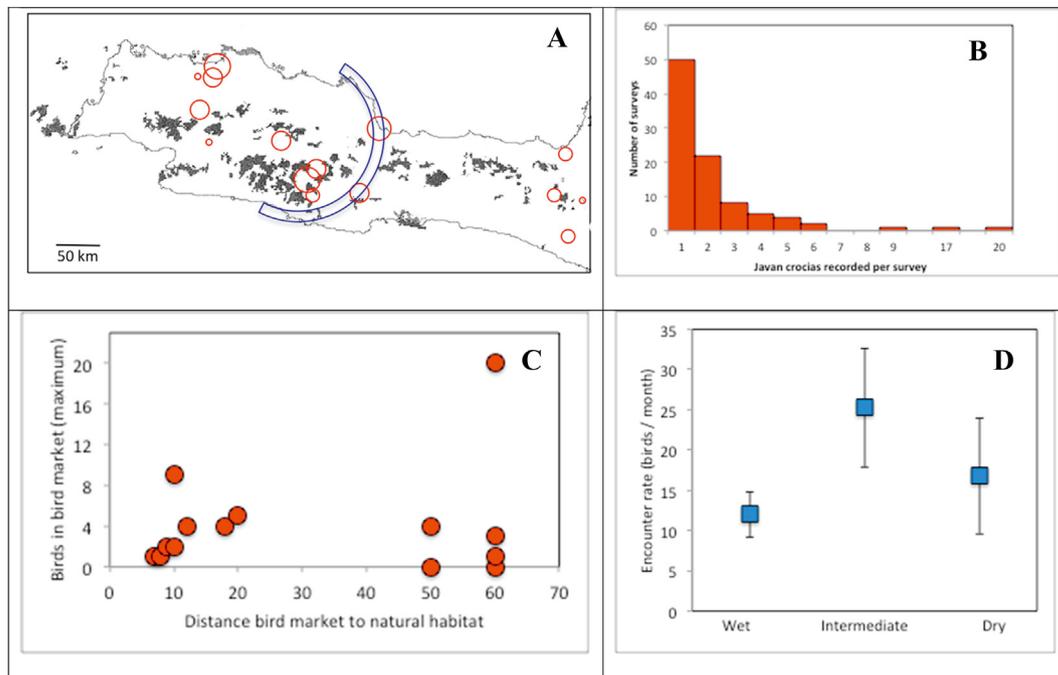


Figure 1. Trade in Javan crocias in bird markets in Java, Indonesia: A, Western and central Java with bird markets and mean number of Javan crocias recorded per survey in five size classes (smallest no records, largest ≤ 4.0 birds/survey); Javan crocias natural range is west of the blue line, gray areas represent the remaining forest; not included in the figure are the markets in Surabaya and Malang in the easternmost part of Java; B, frequency distribution of the number of Javan crocias present in bird markets when the species was recorded to be present showing that mostly single individuals were observed; C, maximum number of Javan crocias recorded in bird markets within the natural range of the species in relation to the distance to the nearest natural habitat; D, encounter rate with Javan crocias in bird markets in Java during the wet, intermediate and drier season.

the last two to three years. Seven sellers were based in Jakarta, one in Bogor, one in Cirebon (all within the distributional range of species), one in Gresik (near Surabaya), and one in Malang, both outside the species' distributional range. For one seller it was unclear where he or she was based other than that it was on the island of Java. In addition, we found two videos posted on YouTube showing birds for sale in two shops in West and Central Jakarta and both included a single Javan crocias. Both videos had information (WhatsApp numbers, street address) on how to contact the sellers.

In total, we obtained 22 quotes for Javan crocias. Corrected for inflation, the mean price was US\$26.70, ranging from US\$3.67 to US\$77.89, clearly reflecting that the monetary value of these songbirds depends on age, sex, and singing ability. We found no change in price over the last 12 years (Figure 2B), suggesting that while the availability of these birds in the bird markets is relatively low at present, demand has not led to an increase in prices.

Turnover and overall levels of trade

The turnover data from the bird markets in Garut suggest that 50% of the Javan crocias are sold within a timeframe of 8 days and 75% of them are sold within 10 days. Taking a naïve estimate of 1.29 birds being present during an average market day, irrespective of the size of the bird market, and establishing that the 21 bird markets we monitored represent approximately half of the number of bird markets in these parts of Java, the total number of Javan crocias sold annually ranges between 1,236 and 1,483 birds, based on 50% and 75% turnover, respectively.

Evidence of enforcement of protected species legislation

We found no evidence of any person being apprehended for trapping, selling, or keeping Javan crocias. We found no evidence for seizures nor for successful prosecution of trappers or traders of this species.

Discussion

Hitherto most research on the trade of songbirds, and indeed other birds such as raptors, owls, and parrots in Asia has focussed mostly on the most commonly traded species or ones that are of conservation interest (e.g. Bergin et al 2018; Eaton et al., 2015; Leupen et al 2018; Nijman et al 2009; Shepherd 2011; Shepherd et al 2020). Studies that focus on single bird markets (e.g. Basuni and Setiyani 1989; Chng et al 2016; Harries et al 2015; Haryoko

2010; Iskandar et al 2020) do give a good overview of the generalities of the trade but species that for one reason or another are not present in that particular market are not picked up as being affected by the trade. We here show that even birds that do not fall in these categories are traded consistently, albeit perhaps in smaller numbers. As such it also becomes more and more clear that the Asian Songbird Crisis (Sykes 2017) indeed affects an exceedingly large number of species. Despite over 40 years of legal protection, Javan crocias are openly traded in a great number of bird markets, mostly within the range of the species but also outside. The trade appears to be largely or exclusively to meet domestic demand, and we have no indication that the trade extends to foreign markets.

Our estimate of turnover of 50% being sold within the first 8 days and 75% in the first 10 days is in line with that what has been estimated for other songbirds in the bird markets of Java (Nijman et al 2018; 2019). We calculate that some 1,200 to 1,500 Javan crocias are sold annually in the bird markets (the online market will add to this number but at present it is not possible to assess turnover or magnitude of this trade). These estimates are in line from what can be inferred from the household survey conducted by Jepson and Ladle (2009), as this is less than they reported for their least common songbird in trade (red-billed leothrix *Leothrix lutea*, with a lower estimate of 1,800 birds), and hence Javan crocias would not make the cut in their survey.

Prices of Javan crocias are low; species that command a similar asking price include commonly traded ones such as long-tailed shrike *Lanius schach*, small minivet *Pericrocotus cinnamomeus*, or cinereus tit *Parus cinereus*. They are considerably less expensive than species such as black-winged myna (means of US\$85: Nijman et al 2018) or Asian fairy bluebird *Irena puella* (US\$65: Nijman et al 2019). In terms of spending power, the mean price of a Javan crocias represents 19% of the government recommended minimum monthly wage for Garut and 8% of that in Bekasi. With few individual birds offered for sale and low asking prices, it is clear that economically the Javan crocias is not an important species for individual traders. Nationally, it is also not an economically important species: even taking the higher estimate of 1,500 birds being sold annually multiplied by a high asking price of US\$40 yields an overall monetary value of US\$60,000.

Seasonality in the number of crocias in trade is possible a reflection of their breeding season (egg-laying between March and June: Hellebrekers and Hoogerwerf 1967) with birds being more easily trapped during the intermediate season. Alternatively, it could be a reflection of trapping effort, with trappers avoiding the wettest four months of the year (when rainfall can exceed 300 to

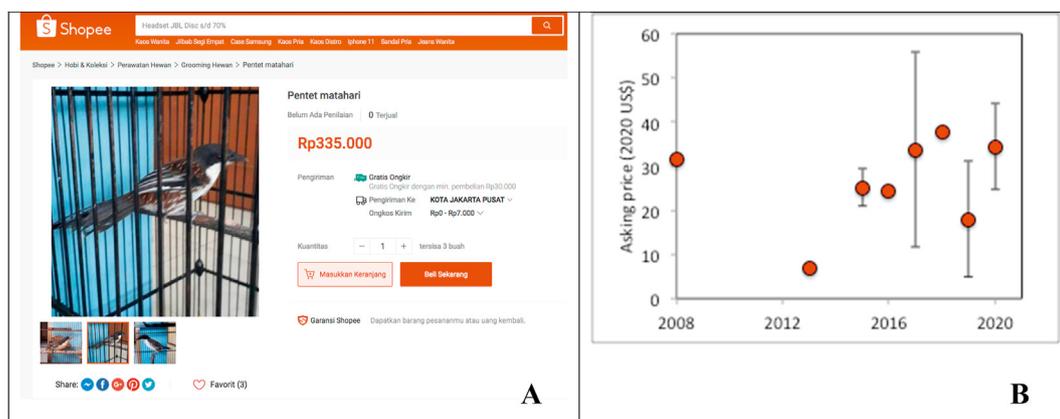


Figure 2. Online trade in Javan crocias in Indonesia: A, an ad from a seller in Jakarta, offering three birds, at a price of US\$24.27 each; shipping is from Taman Sari District in West Jakarta by motorcycle taxi; B, prices adjusted for inflation to 2020 values of Javan crocias showing that while there is marked variation in asking prices over time prices remain stable.

400 mm a month) as well as the drier months because of other commitments such as harvest of rice or other crops. We do not think that the temporal variation in the number of Javan crocias offered for sale is a reflection of a lessening or increase in demand.

The legal protection of Javan crocias appears to be ineffective. The relevant authorities, including the Nature Conservation Agency (BKSDA) entrusted with enforcing protected species legislation, the local Mayoral offices, and the commercial operators that run many of the larger bird markets, need to be encouraged to take strong actions against individuals trapping, selling or keeping illegally sourced Javan crocias (and indeed other songbirds). Bird markets and shops that continue to sell species in violation of the Indonesian legislation should be fined and if the trade continues, forced to close. Strengthened institutional capacity, targeted allocation of existing government funds, and greater collaboration between agencies would allow for systematic monitoring and proper management of songbirds in the wild and in trade. A more focussed approach is needed to engage communities and to educate trappers and wildlife traders about the illegality and unsustainability of the songbird trade and the consequent impact on livelihoods. Only when stakeholders (including communities, trappers, traders, and consumers) truly buy into the opportunities that better regulating the songbird trade offer can we expect change that may have a positive effect on the wild populations of imperiled songbirds.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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