

An assessment of the parrot trade on Obi Island (North Moluccas) reveals heavy exploitation of the Vulnerable Chattering Lory *Lorius garrulus*

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Summary: Trapping for the domestic and international pet trade is a significant conservation threat to several species of psittacine in the Northern Moluccas, Indonesia. Field studies conducted on the status of parrots in this region in the early 1990s assessed the impact of the trade and provided recommendations for regulations, but since then little research has been conducted to update the conservation status of these species. In July–August 2012, we conducted interviews and field surveys to assess the status of the parrot trade in seven villages on Obi Island, Maluku Utara province. We found substantial variation in prices depending on their final market, a heterogeneous pattern of trapping rates around the island, and that parrot trapping is very rarely the primary source of income for the trapper. Here we estimate the annual harvest for the three most commonly trapped species: Chattering Lory *Lorius garrulus*, Violet-necked Lory *Eos squamata*, and Eclectus Parrot *Eclectus roratus*. Our estimate for the minimum annual harvest of the Vulnerable-listed Chattering Lory on Obi is substantially higher than previous estimates for the global annual harvest of this species. It seems likely that the Chattering Lory, and in particular the distinctive *flavopalliatu*s subspecies, is more threatened than is currently assumed. We recommend urgent action to assess the population size of this species on Obi, and suggest that a scheme of stakeholder-led no-take zones may be an effective conservation strategy for parrots on the island.

Ringkasan: Penangkapan satwa untuk perdagangan hewan peliharaan secara domestik dan internasional merupakan suatu ancaman konservasi yang signifikan terhadap beberapa spesies Psittacine di Maluku Utara, Indonesia. Pada bulan Juli–Agustus 2012, kami melakukan wawancara dan survei lapangan untuk meneliti status perdagangan burung paruh bengkok di tujuh desa di Pulau Obi, Provinsi Maluku Utara. Kami menemukan variasi substansial dalam harga yang bergantung pada tujuan akhir pemasaran, pola yang heterogen dari tingkat penangkapan di sekitar pulau, dan penangkapan burung paruh bengkok yang jarang menjadi sumber utama pendapatan para penangkap. Disini kami memperkirakan waktu penangkapan tahunan terhadap tiga spesies yang paling banyak ditangkap: Kasturi Ternate *Lorius garrulus*, Nuri Kalung-ungu *Eos squamata* dan Nuri Bayan *Eclectus roratus*. Estimasi kami terhadap waktu penangkapan tahunan minimum di Pulau Obi untuk Kasturi Ternate yang terdaftar sebagai spesies dengan status Rentan, secara substansial lebih tinggi daripada estimasi-estimasi sebelumnya untuk waktu penangkapan tahunan global spesies tersebut. Berdasarkan estimasi tersebut, Kasturi Ternate dan terutama subspecies *flavopalliatu*s kemungkinan lebih terancam daripada yang diasumsikan selama ini. Kami merekomendasikan tindakan yang mendesak untuk segera mengkaji jumlah populasi spesies ini di Pulau Obi.

Introduction

Trapping for the pet bird industry threatens several species of parrot worldwide (Birdlife International 2013). While the parrot trade has been recently studied in Central America (Cantú-Guzmán *et al.* 2008), South America (Herrera and Hennessey 2007; Gastañaga *et al.* 2011), and Sub-Saharan Africa (Ngenyi *et al.* 2003; Eniang *et al.* 2008), the scale of the problem in the Northern Moluccas, Indonesia, remains poorly known. The Northern Moluccas are a hotspot for parrot trapping, with an estimated minimum of 17,570 parrots trapped in 1991 (Lambert 1993), and 15,000 birds traded in Ternate in 2001 (ProFauna 2002). Several North Moluccan species are traded domestically and internationally, including White Cockatoo *Cacatua alba*, Eclectus Parrot *Eclectus roratus*, Chattering Lory *Lorius garrulus*, and Violet-necked Lory *Eos squamata* (Soehartono and Mardiasuti 2002).

In 1991–1992, Lambert conducted the first assessment of parrot populations and trade in the Northern Moluccas, visiting Halmahera, Bacan, and Obi (Lambert 1993). He estimated that 9,600–9,927 Chattering Lories and 2,850–2,980 Violet-necked Lories were being trapped in the Northern Moluccas each year, and recommended improving law enforcement in the province, setting a sustainable catch quota for parrots, and establishing parrot concessions. Since his study, ProFauna has launched two reports investigating the trade in the region, and their stakeholder and public engagement initiatives seem to have helped reduce the use of Ternate as a major regional market (ProFauna 2007). However, the scale of parrot trade in Indonesia remains substantial, with little law enforcement and an ineffective quota system which sets quotas based on trader demand rather than non-detrimental findings (ProFauna 2007; Nijman 2010; Lyons and Natusch 2011).

In Indonesia, bird keeping is an extremely popular hobby (Jepson and Ladle 2009). A large-scale survey of the five largest cities in Indonesia found that birds were the most popular urban pets, kept by 22% of respondents (Jepson and Ladle 2005). Although songbirds are the most popular type of pet bird, an estimated 60,000 wild caught native parrots are kept in Indonesia's five major cities (Jepson and Ladle 2005). While these studies have provided insight into parrot keeping in urban Indonesia, little research has been conducted on parrot keeping in rural areas.

Here we provide, after 20 years, a much-needed update on the state of the parrot trade on Obi Island. Obi is home to seven psittacine species (Mittermeier *et al.* 2013) including endemic subspecies of Red-cheeked Parrot *Geoffroyus geoffroyi obiensis* and Violet-necked Lory *Eos squamata obiensis*. Obi is also one of only two islands, the other being Bacan, where the distinctive yellow-backed subspecies of the Chattering Lory *L. g. flavopalliatius* occurs. Chattering Lory is globally renowned in the pet trade and is the most popular bird species exported from eastern Indonesia (Birdlife International 2013). It is currently listed as Vulnerable under the IUCN, primarily because of overharvesting for this trade, although habitat destruction through large-scale logging is also a concern (Birdlife International 2013). Given these threats, it is important to quantify the scale of exploitation of Chattering Lory on Obi Island.

Methods

We visited Obi from 5 July–27 August 2012 and conducted field surveys and structured interviews in seven villages around the island. In each village, the head of the village was asked to recommend suitable interview candidates, and after background data were collected, interviewees were asked a series of questions by E.C.P., N.M.A., and E.H on hunting and parrot trapping. These included: the number of parrot trappers in their village, how many parrots they trapped per month, and how much parrots are sold for at this stage in the trade chain.

We also conducted a census of parrot keeping in five villages around the island (Laiwui, Jikotamo, Kampon Buton, Sum, and Air Mangga). In each village we walked along the main street and counted the number of parrots in the first 40 households. For households that had parrots, we recorded the species, number of parrots, how long the parrot had been a pet, how and where it was procured, how much it was bought for, and why they had it. Households that were home to parrot trappers or traders, and so had temporarily inflated numbers of parrots, were excluded from the analysis. We augmented our social survey results with incidental parrot observations while conducting point counts in forests around Obi (see Mittermeier *et al.* 2013). These point counts were designed to sample the general avifauna, and were not targeted at calculating parrot densities. However, they allowed us to cross-reference information about parrot distributions garnered in the interviews.

As the data were non-parametric, a Kruskal-Wallis test was used to identify significant differences in the number of parrots kept between the five villages surveyed. A Mann-Whitney U test was used to identify specific differences between villages, with a Bonferroni correction of 0.01 to reduce the likelihood of Type I errors (Field 2009). The procurement methods and reasons for keeping parrots were both examined using a chi-squared test. For the three most commonly trapped parrots, Eclectus Parrot, Chattering Lory, and Violet-necked Lory, we compared the mean price trappers reported selling each for. Here, a Kruskal-Wallis test with *post hoc* Mann-Whitney U tests was conducted, on this occasion using a Bonferroni correction of 0.017, as there were three species for comparison. Differences between the numbers of parrots trapped in villages on Obi were also tested for significance using a Kruskal-Wallis test. We used figures reported by parrot trappers on the number of parrots they captured per month to estimate the annual parrot harvest on Obi, and are confident that we interviewed all parrot trappers in each village surveyed. We used the minimum number in cases where trappers reported a range of parrots trapped per month, and therefore consider our final estimate to be conservative.

To obtain a harvest estimate for the entire island, we asked parrot trappers which villages did or did not trap parrots. This, along with our survey data, suggested there were substantial inter-village differences in trapping activity. Indeed, with the exception of Fluk, the remaining unsurveyed villages were not reported to trap parrots commercially. To include trapping activity in Fluk in our estimate for the island, we calculated the average number of each species caught in the other trapping villages, and assigned these scores to Fluk. All analyses were conducted in IBM SPSS Statistics 21 (IBM 2012).

Results

Of the households we surveyed, 27% (54 of 204) kept parrots as pets. Observations around the island found 12 species of bird kept as pets, 8 of which were psittacine (Table 1). In the five villages surveyed, the number of parrots kept differed significantly ($H_{(4)}=13.4$, $p<0.01$), although the only significant differences in the *post hoc* Mann-Whitney U tests were between Kampon Buton and both Laiwui and Air Mangga (Fig. 1; Kampon Buton vs Laiwui $U=546.5$, $p<0.01$, $r=-0.31$; Kampon Buton vs Air Mangga: $U=542.5$, $p<0.01$, $r=-0.34$) using a Bonferroni correction of 0.01.

The most popular pet was Chattering Lory (Plate 1), with an average of 0.2 per household, followed by Violet-necked Lory with 0.14. Eclectus Parrot and White Cockatoo were much rarer pets, with averages of 0.07 and 0.01 per household respectively. Of the households who kept pet parrots, 59% bought their parrots, 32% caught their parrots themselves, and 9% were given parrots as a gift from a friend or relative ($\chi^2_{(2)}=20.33$, $p<0.005$). The main reason given for keeping parrots was for entertainment (44%), followed by a toy for children (28%), ornamental decoration (7%), to sell (6%), or for other reasons (15%; $\chi^2_{(4)}=28.41$, $p<0.005$).

Table 1: Species of bird kept as pets on Obi. These birds were incidentally observed over the course of 52 days on the island.

Common name	Scientific name	No. observed	Origin
Red-flanked Lorikeet	<i>Charmosyna placentis</i>	<20	Obi
Violet-necked Lory	<i>Eos squamata</i>	<100	Obi
Chattering Lory	<i>Lorius garrulus flavopalliatu</i> s	<200	Obi & Bacan
Purple-naped Lory	<i>Lorius domicella</i>	<10	Ambon & Seram
Black-capped Lory	<i>Lorius lory</i>	<10	Papua
Eclectus Parrot	<i>Eclectus roratus</i>	<50	Obi
White Cockatoo	<i>Cacatua alba</i>	<20	Bacan & Halmahera
Yellow-crested Cockatoo	<i>Cacatua sulphurea</i>	<10	Sulawesi
Western Crowned Pigeon	<i>Goura cristata</i>	<10	Misool
Spectacled Imperial Pigeon	<i>Ducula perspicillata</i>	<10	Obi
Nicobar Pigeon	<i>Caloenas nicobarica</i>	<10	Obi
Blyth's Hornbill	<i>Rhyticeros plicatus</i>	<10	Obi

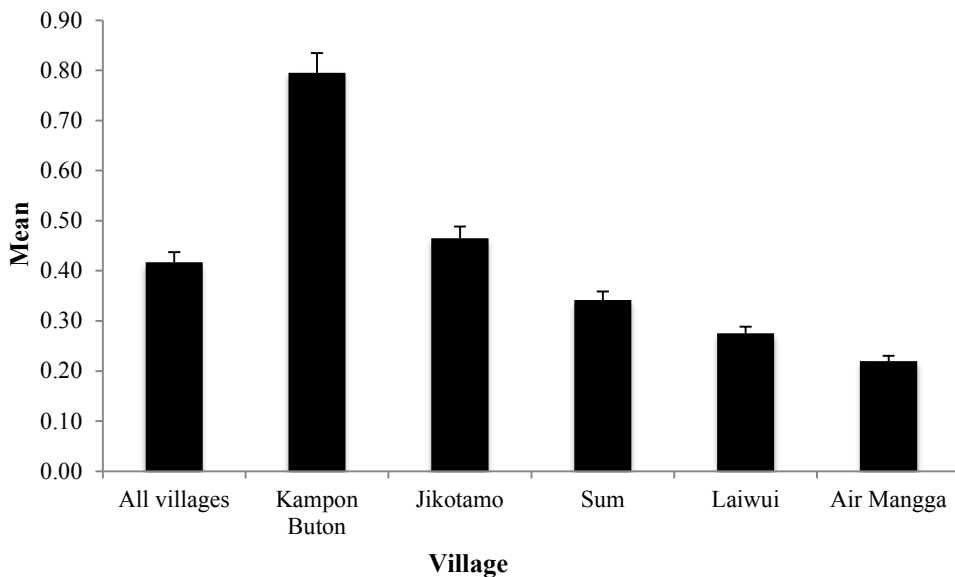


Fig 1: Mean number of parrots kept as pets per household in villages on Obi. Bars indicate 95% confidence intervals.

The value of the parrot trade on the island is indicated by the prices parrots are sold for, along with the number of parrots trapped per year (Table 2). The Chattering Lory was the most frequently trapped species (with an estimated annual harvest of 5,976±891), with substantially lower numbers of Violet-necked Lory and Eclectus Parrot captured. The most expensive parrot was the Eclectus Parrot (IDR 270,000±140,000), followed by the Chattering Lory, and then Violet-necked Lory (for comparison, when the study was conducted in July 2012, IDR 100,000 was the equivalent of USD 10.58). The differences in parrot prices according to species were significant, $H_{(2)}=29.67$, $p<0.001$. The *post hoc* tests confirmed that the difference in prices between each pair of species were significant, especially in the case of Eclectus Parrot versus Violet-necked Lory, which had a very large

effect size ($U=0$, $p<0.001$, $r=-0.75$). The comparison of Chattering Lory and Violet-necked Lory prices ($U=32$, $p<0.001$, $r=-0.52$) and Chattering Lory versus Eclectus Parrot prices ($U=169$, $p<0.001$, $r=-0.52$) also revealed large effect sizes (Cohen, 1992).

While 17 (35%) of the 48 people interviewed regularly trapped parrots, with one exception, it was not their primary source of income. The number of parrots trapped varied significantly between villages (Fig. 2), with parrot trapping concentrated in the villages of Kampon Buton and Wayaloar. In other villages, the trapping rate was negligible (no parrots were reportedly trapped in Sum or Air Mangga, for example). The species with the highest annual harvest was the Chattering Lory, followed by the Eclectus Parrot, and then Violet-necked Lory (Table 2).



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Plate 1: Chattering Lories (*Lorius garrulus flavopalliatius*) at a trader's house in Jikotamo.

Table 2: Estimated number of parrots trapped on Obi each year. Numbers are means \pm 95% confidence intervals, and prices are Indonesian Rupiah (IDR), quoted in 2012. At the time of the survey, IDR 100,000 was the equivalent of USD 10.58. Prices are rounded to two significant figures. "n" refers to the number of price estimates provided by hunters for each species.

Common name	Estimated annual harvest (mean \pm CI)	Price in IDR (mean \pm CI)
Chattering Lory	5,976 \pm 891	170,000 \pm 5,700; n=36
Eclectus Parrot	810 \pm 153	270,000 \pm 140,000; n=24
Violet-necked Lory	1,092 \pm 160	16,000 \pm 2,200; n=8

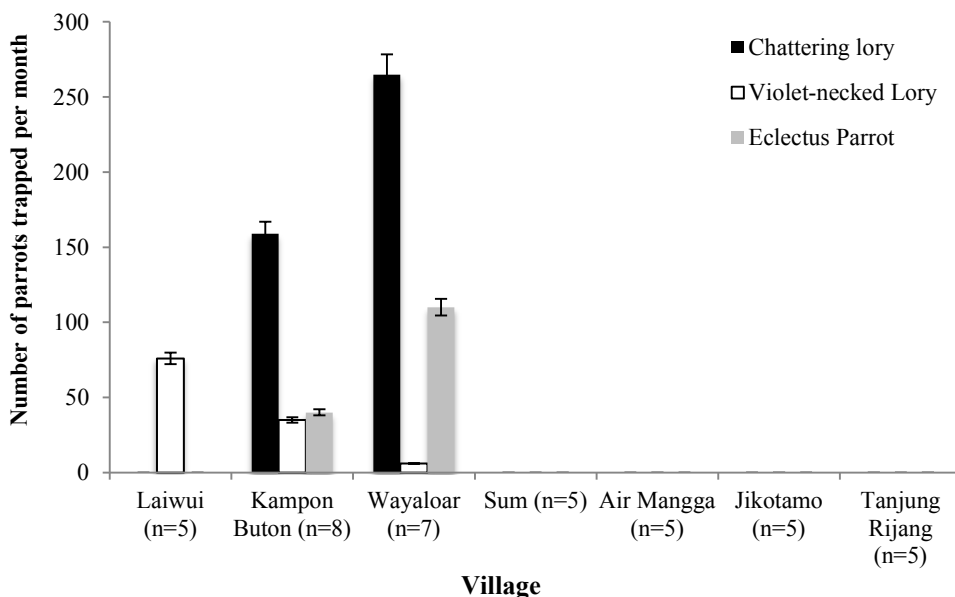


Fig 2: Number of parrots trapped in each village per month. $H_{(6)}=28.9$, $p<0.001$. Mean rank for Wayaloar=39.57, Kampon Buton=29, Laiwui=28.6, all other villages=16.5. Error bars are 95% confidence intervals.

Discussion

Our results reflect the magnitude of the parrot trade on Obi, and the importance of parrot keeping in a rural Indonesian society. The percentage of households who keep parrots as pets on Obi (27%) is of a similar order to the percentage of urban households who keep birds (22%; Jepson and Ladle 2005), suggesting that the culture of bird keeping in Indonesia may be robust across urban-rural societies. However, in urban Indonesia Jepson and Ladle (2005) found using birds as gifts to be a major cultural practice, with 47% of pet birds procured in this fashion. On Obi, this practice was unusual, with only 9% of pet parrots received as gifts. This may be partially explained by the ease of procurement due to the high supply of parrots, and by the relative ease of catching your own parrot locally (32% of captive parrots in this survey were caught by their owners, compared to 10% in an urban setting; Jepson and Ladle 2005).

The importance of parrot keeping in this part of rural Indonesia is a concern for the conservation of these parrots. Worryingly, the most popular species—the Chattering Lory—is also the most threatened (Birdlife International 2013). Therefore any policy aimed at tackling the parrot trade in the Northern Moluccas will also have to account for domestic bird keeping in rural areas.

There was substantial variation in the price of parrots trapped on Obi, not only between species, but also within species, as indicated by the confidence intervals in Table 2. This may be explained by the existence of several different markets, depending on who the parrot is being sold to. For example, one trapper reported selling parrots for low prices if he was selling to Obi residents (IDR 100,000 for a Chattering Lory or Eclectus Parrot), but charged higher prices if he was selling to soldiers and miners (IDR 500,000 for a Chattering Lory and IDR 1,000,000 for a Eclectus Parrot), who would take parrots home to other islands in Indonesia. A third, international, market was also reported where parrots were sold to

international traders in boats offshore, destined for markets in Sulawesi, the Philippines, and China.

Despite being estimated conservatively, our expected annual harvest rates of parrots on Obi are high. Given the observed abundance of Violet-necked Lory around Obi, we do not believe their estimated harvest rate to be a major conservation concern. Eclectus Parrots were uncommon on Obi, and although the species is widespread and globally classified as Least Concern (IUCN 2013), their high estimated harvest rate raises the possibility that they may become locally extirpated. In this context, the subspecies *E. r. vosmaeri* of the North and Central Moluccas may be somewhat threatened. A basic population assessment would therefore be helpful in assessing the pressure this level of trapping places on the Obi population.

In the case of Chattering Lory, Lambert (1993) estimated the entire population for Obi to be 6,746–16,144, and as a result this harvest rate could lead to the rapid extirpation of the species on the island. Field studies in Halmahera suggest that the population densities estimated in 1992 may have been low, with some reports of densities as high as 149 birds per square kilometre in primary forest (Poulsen *et al.* 1999). Indeed Birdlife International suggests that the global population of Chattering Lories may be higher than originally estimated (Birdlife International 2013). Although we did not quantify the population size of wild Chattering Lories, we did observe the species to be relatively common on Obi in areas where they were not trapped, such as the Tanjung Rijang logging concession and central highlands, and so it is possible that the Chattering Lory population may be larger than originally thought.

Even if Chattering Lory populations on Obi are higher than previously believed, a minimum estimated harvest rate of 5,976 birds per year is concerning. It is much higher than the estimate of 5,000 per year, across all islands, used by Birdlife International to assess the species' conservation status (Birdlife International 2013). We argue that our research, with support from previous studies, suggests the figure used by Birdlife is considerably lower than the true annual harvest. For example, Lambert (1993) observed 2,088 birds in holding cages over five months on Bacan, and estimated that 4,450–6,760 birds were exported from the island in this period. Furthermore, official trade statistics, believed to account for one-quarter to one-half of the trade (Nash 1992; Birdlife International 2001), indicated that 6,135 Chattering Lories were captured in 1990, and this figure was believed to be increasing (Nash and Edwards 1992; Lambert 1993).

If the rate on Bacan is of a similar magnitude (which Lambert's 1992 data suggest), the *flavopalliatu*s subspecies of Chattering Lory is likely to be under much greater risk than previously believed. This subspecies occupies a range of less than 5,000km² (Obi and Bacan have a combined area of 4,400km²) and were it to be assessed as a distinct species, IUCN Red List criteria would likely warrant its classification as Endangered (IUCN 2012). Our observations around Obi suggest that this species has been extirpated from many lowland forests around settlements (Mittermeier *et al.* 2013), something which has also occurred on Bacan (Milton and Marhadi 1987). Should such reductions in the area of occupancy be consistent across its range, the Chattering Lory may warrant re-listing back to Endangered regardless of whether *flavopalliatu*s is considered separately.

Following our observations, we recommend that fieldwork be urgently conducted to estimate the population of Chattering Lory on Obi. Given the size of Obi and the extreme variations in Chattering Lory abundance, this task is not trivial, but is certainly within the competencies of several Indonesian NGOs. This would provide the basic data needed to assess the proportion of the population that is trapped annually, and indicate how sustainable the harvest rate is.

In the absence of such data, there are still several promising avenues for conservation. The abundance of Chattering Lorries in close proximity to settlements in the Tanjung Rijang logging concession was striking, especially in contrast to their absence in the vicinity of all other villages. The Telagabakti Persada Logging Company should be applauded for their efforts in enforcing a trapping ban in their concession, and given their success, this approach may be used as a model for other areas of the island. Developing Lambert's (1993) parrot concession proposal, establishing a handful of "no-take" zones on Obi may help safeguard "source populations" of Chattering Lory on the island, which should be a win-win solution for conservationists and trappers. Given the relatively small number of parrot trappers on Obi, a series of stakeholder meetings at the key trapping villages may be sufficient to launch a no-take zone system.

Should such measures fail, it may be worth reassessing the status of Chattering Lorries under CITES, with a view to listing it under Appendix II. However, the scale of the domestic trade and the lack of law enforcement in the North Moluccas suggest that this is less likely to be successful than constructive stakeholder engagement.

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