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Cover: Golden-headed Lion Tamarin *Leontopithecus chrysomelas*. Watercolor and acrylics by P. Kritika.

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ARTICLE

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Field observations and citizen science reveal ecological insights into rare and threatened parrots in the Philippines

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Abstract: Despite their charismatic appeal and threatened conservation status, parrots of the genera *Tanygnathus* and *Prioniturus* remain poorly studied throughout their range. Their inconspicuous behaviour, elusive nature, and rarity further hinder efforts to gather comprehensive ecological data. In this study, we describe the breeding behaviour, diet, and nesting phenology of the Blue-naped Parrot *Tanygnathus lucionensis* and the Green Racquet-tail *Prioniturus luconensis*, combining field observations and citizen science data to acquire insights into their ecology. Field observations were conducted at Subic Watershed Forest Reserve from February to June 2022 and March to August 2023. Results show that *T. lucionensis* exhibits a long breeding period, with multiple copulation events, male-to-female regurgitative feeding, and biparental care—traits consistent with the reproductive behaviour of Old World parrots. However, fieldwork did not locate any nests of actively breeding *P. luconensis* during the study period. To supplement field observations, we analyzed 1,281 media records of both parrots dating from 2012 to 2025, sourced from two citizen science platforms: eBird and Facebook. These records revealed that *P. luconensis* breeds year-round, while *T. lucionensis* breeds predominantly in the dry season. Both species are confirmed as mixed plant resource feeders, primarily consuming fruits but also feeding on flowers, leaves, and bark. Notably, 73% of records were native plant species from diverse families, asserting the importance of planting native species as food resources for parrots. Our findings provide much-needed baseline information to inform future ecological research and conservation strategies for these understudied parrot species.

Keywords: Breeding biology, cavity-nesting birds, eBird, Facebook, nest, Old World parrots, *Prioniturus*, Psittaculidae, social media, *Tanygnathus*.

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Author contributions: VAGG and CPE conceptualized the study and developed the methodology for field observations. VAGG conducted the investigation, performed the analyses and interpretation, and led the writing of the manuscript. CPE was responsible for funding acquisition, provided supervision, and performed critical review and editing of the manuscript.

Filipino abstract: See end of this article.

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INTRODUCTION

Tanygnathus and *Prioniturus* (Psittaculidae) are genera of Old World parrots restricted to the Philippines and Indonesia. The genus *Tanygnathus* is currently represented by five species, with three occurring in the Philippines. Meanwhile, *Prioniturus* consists of 10 species, seven of which are endemic to the Philippines (Billerman et al. 2022). Despite their charismatic appeal, information on the breeding and diet for both genera remains limited, as they are particularly challenging to study due to their inconspicuous and highly elusive nature, along with their rarity and cavity-nesting behaviour — with even large parrots now absent from virtually intact habitats (Española et al. 2013). Breeding and diet are fundamental components of a species' ecological niche. Together, they offer valuable insights into a species' natural history that can be of significant conservation importance, especially for threatened and poorly known taxa. Unfortunately, knowledge of breeding biology remains severely limited for tropical forest bird species in Southeast Asia (Xiao et al. 2016). This gap is particularly pronounced among specialized breeders such as cavity-nesting birds in Asia (Cornelius et al. 2008; Cockle et al. 2012; Lammertink 2014), especially in the Philippines (Gicaraya & Española 2024a; Gicaraya et al. 2025). Similarly, avian diet remains poorly documented in the Philippines, mirroring a broader trend across tropical Asia (Sankamethawee et al. 2011). Dietary observations exist for a few species such as those compiled in Birds of the World (Billerman et al. 2022), with fewer species having dedicated field-based observations as in the case of the threatened Philippine Cockatoo *Cacatua haematuropygia* (Widmann et al. 2001) and hornbills (Gonzalez 2007; Widmann et al. 2015; Gicaraya & Española 2024b). Nonetheless, comprehensive studies are still lacking.

Luzon Island, located in northern Philippines, is home to several large parrots, including the endangered Green Racquet-tail *Prioniturus luconensis* and the near-threatened Blue-naped Parrot *Tanygnathus lucionensis* (Española et al. 2013; Allen 2020). The Green Racquet-tail (GRT), endemic to the island, appears monotypic but is sexually dimorphic, with males appearing yellowish whereas females are uniformly greener. Most information about its genus is based on a few species (Billerman et al. 2022): Blue-crowned Racquet-tail *P. discurus* with breeding observations in central (Negros-Panay) and southern (Greater Mindanao) Philippines, Yellow-breasted Racquet-tail *P. flavicans* in Sulawesi (Walker & Seroji 2000), and Buru Racquet-tail *P. mada* in Buru, South Moluccas, Indonesia.

The Blue-naped Parrot (BNP), formerly widespread across the Philippines, is now limited to a few islands in the archipelago. This large, green parrot is distinguished by its red beak and yellow-and-blue wing feathers. It has been reported to breed from April to June in tree cavities (Collar et al. 2020) with further breeding data remaining scarce. As with most *Tanygnathus* parrots, information on the genus is largely limited to a handful of breeding observations in the wild and in captivity (Billerman et al. 2020).

In this paper, we aim to provide insights on the biology and ecology of the above-mentioned parrots in Luzon and acquire baseline information for their conservation through field observations and citizen science. Citizen science serves as a useful tool for studying diverse taxa, offering opportunities to acquire data on specific species across broad temporal and spatial scales—efforts that would otherwise be challenging to achieve through traditional field observations alone (Hall et al. 2021). Citizen science has been instrumental in elucidating the natural history of lesser-known species and in understanding aspects of a species' ecology (Lees & Martin 2015; Zeng et al. 2018; de Souza et al. 2022; Díaz et al. 2024). In recent years, social media platforms such as Facebook have emerged as a valuable platform for citizen science. Through this social media platform, researchers were able to improve our knowledge of cryptic species distributions (Tabeta & Bejar 2025), enable the crowdsourcing of specimens to collect historical records and biological data (O'Connell et al. 2025), and establish an early warning system for potential new species invasions (Marcenò et al. 2021), demonstrating the potential of the platform as a data-rich hub that can be tapped for biodiversity research. Here, we present the breeding behavior of the parrots through field observations, ascertain their diet through citizen science, and determine their nesting phenology by piecing together data from field observations and citizen science to arrive at a comprehensive picture of the two parrots' breeding cycle.

MATERIALS AND METHODS

Study Site

Breeding observations were conducted at the Subic Watershed Forest Reserve (SWFR), in the provinces of Bataan and Zambales, Luzon Island, Philippines. SWFR is a semi-evergreen lowland forest situated west of Luzon Island. It is characterized by vegetation dominated by

dipterocarps primarily *Shorea contorta* and deciduous tree species *Parkia timoriana, Pterocymbium tinctorium,* and *Dracontomelon dao* (Fernando et al. 2008; Gicaraya et al. 2025). Wherever the canopy is open, thick bamboo thickets emerge. Subic Watershed Forest Reserve is a mosaic of open and closed canopy forests, interspersed with industrial zones, agricultural, and residential areas. The area has rugged terrain with elevations ranging 0–300 m. West Luzon has distinct dry and wet seasons occurring in January–May and June–December of every year, respectively. Precipitation typically ranges 50–100 mm in the dry season and 400–800 mm in the wet season (Corporal-Lodangco & Leslie 2017).

Fieldwork Procedures

A thorough nest hole search was undertaken in all accessible areas of the SWFR, along pre-existing and off-trail routes, for two consecutive breeding seasons—February–June 2022 and March–August 2023—with efforts made to survey the site as comprehensively as conditions allowed. Following Gicaraya & Española (2023) and Gicaraya et al. (2025), trees were inspected for cavities either by tracking flying and calling parrots or by observing potential nest trees for breeding-related activities through a pair of 10 × 32 Solognac binoculars. In addition, we interviewed local people and wildlife photographers for previously active nests that we could monitor for possible occupancy. We confirmed active breeding from sightings of parrots staying inside the cavity for prolonged periods of time during the day. Focal nests per species were observed for breeding-related activities in a blind of trees at least 50 m from the nest tree using a KOWA spotting scope (TSN-60). Per observation period, we took note of the general diurnal breeding behaviour, including visible activities within the nest cavity, activities surrounding the nest tree, and when possible, sex roles and parental care strategies. We categorized activities into six types: peeking, preening, out of the nest, feeding, calling, and no visible activity. We then recorded the number of hours spent on each activity per observation day and calculated their respective proportions to understand how these activities vary and change throughout one nesting period. Unfortunately, only the BNP proceeded with breeding between the two parrot species among nests located. Most breeding-related data for the GRT, as well as diet information for both species, were obtained through citizen science.

Citizen Science Data Collection

To gather ecological data on the parrots, citizen science data was used. Photographs and videos of GRT and BNP were sourced from two citizen science platforms—eBird and Facebook. In these platforms, we filtered available media from January 2010 to January 2025. In eBird, we clicked on the 'Explore' bar and typed in '*Prioniturus luconensis*' and '*Tanygnathus lucionensis'*. We filtered the location to "Philippines" and manually searched for any media of feeding parrots located. In Facebook, we clicked on the search bar and typed 'Green Racquet-tail/Green Racket-tail', 'Blue-Naped Parrot', '*Prioniturus luconensis*' '*Tanygnathus lucionensis' and 'loro/pikoy/kalangay'* and manually examined photos of feeding parrots posted as public by bird enthusiasts or photographers. We also examined photos from Facebook groups dedicated to birdwatching and wildlife photography: 'Wildlife Photographers of the Philippines', 'Philippine Bird Photography Forum-FB Group', 'Birdwatch Philippines Community', and 'Wild Bird Photographers of the Philippines'. Administrators of these groups require members to post photographs with date taken and general location, nonetheless, we validated the said information from the content owner through Facebook Messenger. We also asked each content owner for additional observations, further fruit/tree descriptions, and possible identity of the fruit sample in their photo. Similarly, for photos with a parrot perched on a fruiting tree, we asked the content owner if the bird was feeding on it before or after the photo was taken. All plants were verified and identified to the lowest taxonomic level by an expert botanist from the University of the Philippines Diliman.

Similarly, we tried to construct the nesting phenology of both parrots using similar methodology as stated above. We searched for photos of parrots in any stages of breeding: copulation, nest building, activity surrounding a nest, feeding of nestlings in a cavity, adults feeding fledglings, or sightings of fledglings. We took note of the date when the photos were taken and had the media owners verify their authenticity and asked for any other observations regarding their record.

RESULTS

Breeding Behavior

Green Racquet-tail (GRT)

We observed a pair of GRT visiting Nest A on 28 May 2022 (Image 1a) and Nest B on 6 March 2023 (Image 1b). Both nests were woodpecker-made cavities excavated on dead trees. In both nests, we observed cavity

inspection behaviour in which the female entered and exited the cavity nest multiple times while maintaining vocal contact with the male. The male parrot did not enter the cavity and was perched only in a nearby tree. Nest inspection lasted 3–20 minutes after which the pair left the site together. A summary of the key behaviours is presented in Table 1. Unfortunately, both pairs did not proceed with nesting.

Copulation attempts of a different pair were observed on 02 March 2023. Fledglings with short spatules were also observed within the site on 3 April and 23 April. For both dates, two juveniles were seen with the adults, suggesting a brood size of two. During these dates, it was noticeable that the juveniles were more vocal than the adults. We also observed an adult racquet-tail feeding a juvenile on 23 April 2023.

Blue-Naped Parrot (BNP)

We located and observed two nests of actively breeding BNP, both in woodpecker-excavated cavities on dead trees. On 27 March 2022, we observed a BNP occupying Nest C. The parrot remained inside the cavity for most of the day and only left upon the arrival of one or two other adult parrots. During these interactions, the pair or group flew to a nearby tree, where the nesting parrot was fed through regurgitation. Copulation was also observed, during which the nesting parrot was mounted, thereby confirming it as the female.

Image 1. Green Racquet-tail was seen inspecting a woodpecker-excavated cavity on a—28 May 2022 | b—06 March 2023. © Vince Angelo G. Gicaraya.

Table 1. Key behavioural observations in two nests of GRT. Effort in hours (h) pertains to observation effort per day.

Nest code	Date	Effort (h)	Key behaviors	Breeding stage
A	28 May 2022	6	Female inspected cavity for 20 minutes; entered/exited multiple times; male perched on a nearby tree; both birds vocalizing. The pair departed together after inspection.	Nest establishment, Pre-egg-laying
A	29 May, 03 June 2022	6	No activity observed.	Nesting did not proceed
B	6 March 2023	2	Female inspected cavity for 15 minutes; entered/exited; both birds vocalizing. The pair departed together after inspection.	Nest establishment, Pre-egg-laying
B	3 April 2023	2	Female inspected cavity for 3 minutes; both birds vocalizing. The pair departed together after inspection.	Nest establishment, Pre-egg-laying
B	18 May 2023	2	No activity observed.	Nesting did not proceed
B	June 2023	0.5	Nest was found felled.	

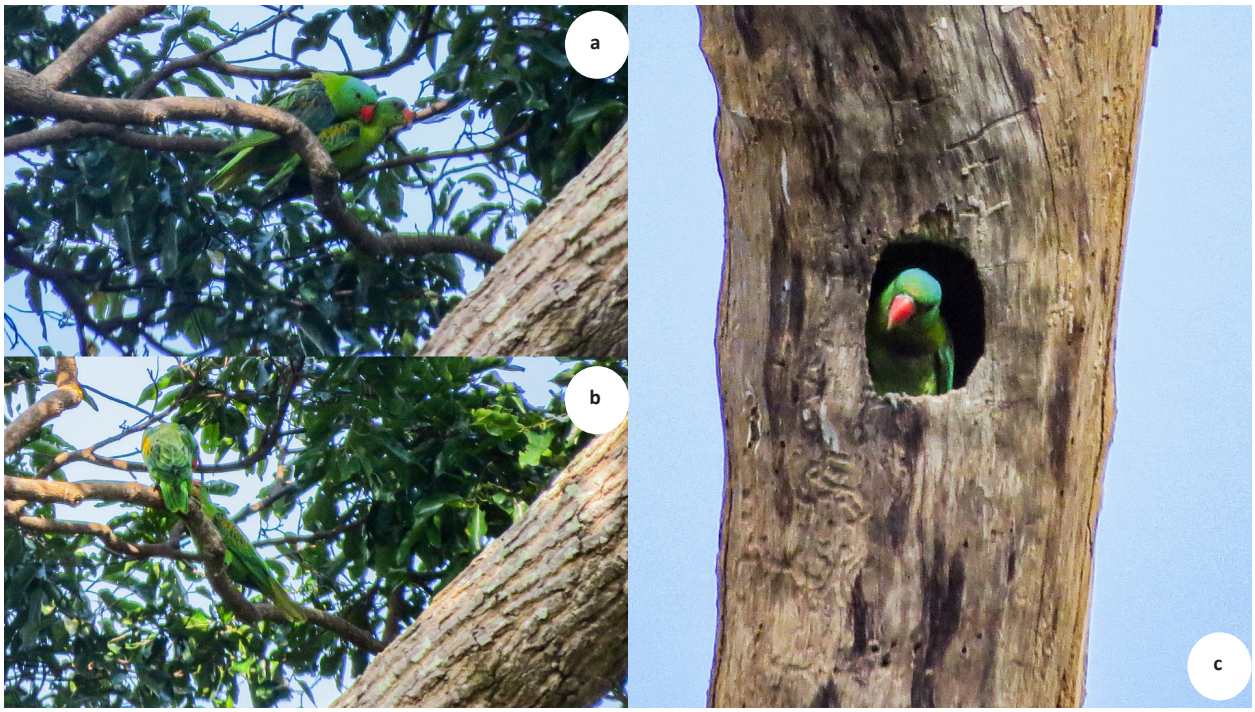

Image 2. Blue-naped Parrot activities in and surrounding an active nest: a—parrots copulating on a nearby tree | b—male parrot (top) feeding the female parrot (below) after copulation | c—female parrot peeking through the cavity entrance after the arrival of the male. © Vince Angelo G. Gicaraya.

Table 2. Key behavioural observations in two nests of BNP. Effort in hours (h) pertains to observation effort per day. Code: U = undetermined.

Week	Nest code	Date	Effort (h)	Key observations	Breeding stage
U	C	27 March 2022	8	Parrot stayed most of the time throughout the day. Nesting parrot flew to a nearby tree and was met by an adult parrot which fed it through regurgitation. Feeding lasted 5 minutes.	Courtship, Pre-egg-laying
U	C	31 March 2022	8	Two adult parrots visited the nesting parrot. The small group flew to a nearby tree. One parrot copulated with the nesting parrot twice lasting 3 minutes. Male fed the female afterwards through regurgitation.	Copulation, Pre-egg-laying
1	D	02 & 03 March 2023	24	Six parrots socializing on the nest tree. Cavity inspection by an adult parrot. Two adult parrots attempted to copulate but failed. Multiple nest visitations by the male in the afternoons. Successful copulation (3-4 minutes) in two consecutive days. Post-copulatory feeding (2-10 minutes).	Courtship, Nest establishment, Copulation, Pre-egg-laying
4	D	22 March 2023	12	Female parrot mostly stayed inside the cavity nest. Left only thrice that day, usually accompanied by the male. Female parrot was seen peeking through the cavity opening with either a fruit or leaf.	Onset of incubation; high nest cavity attendance
6	D	3 April 2023	12	Female had ruffled belly feathers. Nesting female was only out twice, joined by male. Male fed the female. Male visited twice briefly.	Brooding behavior evident; high nest cavity attendance
12	D	18 May 2023	12	Female returned with messy beak. Head movements inside the cavity nest suggest feeding of nestlings. Coleto *Sarcops calvus* briefly inspected the cavity then left.	Nestling stage; nestling provisioning behavior evident
18	D	15 June 2023	12	Two feeding events. Feeding was done by the female while perched at cavity rim. The nest was left unattended for 5.8 hours that day.	Nestling stage; nestlings likely older; reduced cavity nest attendance
22	D	3 July 2023	12	Female peeked through the cavity opening during Dollarbird *Eurystomus orientalis* visit (no usurpation). Regurgitation inside the cavity nest. Rapid exit-return movements (3x).	Late nestling to fledging stage; reduced cavity nest attendance
28	D	19 August 2023	12	No visible activity	Presumed fledging completed

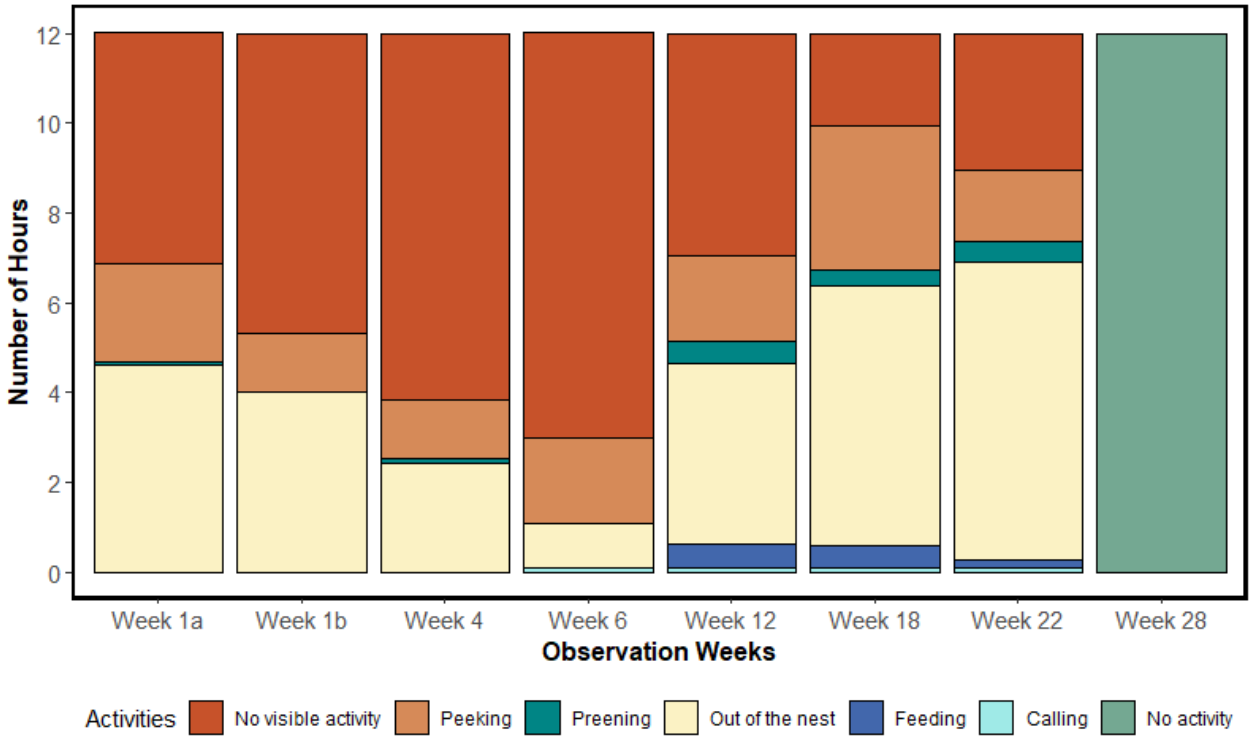

Figure 1. Diurnal activities of the female Blue-naped Parrot inside and surrounding an active nest observed from 0600 h to 1800 h.

The second nest, Nest D, was observed from March to August 2023, which we have observed from cavity inspection and courtship to fledging. Early observations were consistent with those previously recorded on Nest C, that is social behavior with a group of parrots, post-copulatory feeding, and male to female feeding through regurgitation (Image 2b). We also noted multiple copulation events in which the nesting parrot was mounted (Image 2a), thereby confirming it as the female. Nest attendance of the female parrot was highest during the first six weeks of observation (Image 2c, Figure 1), consistent with the onset of incubation and brooding periods. Later observations indicated chick provisioning by the female, evident from its messy mandibles, regurgitation behaviour, and increased time spent outside the nest (Figure 1). The male parrot was not observed provisioning for the brood but was consistently feeding the female and likely foraging with her in the later weeks of observation. By 19 August 2023, the nest had been completely vacated with the brood likely fledging between 4 July (Week 22) and 18 August (Week 28). A summary of the key behaviours is presented in Table 2.

Diet

We assessed 1,281 photos of parrots (n = 403 for GRT, n = 878 for BNP) dating from 2012–2025 across two citizen science platforms, eBird and Facebook. eBird had the highest number of records but Facebook had the greatest number of unique photos (Table 3). Many eBird entries were deemed unusable in analyzing the nesting phenology as they do not bear dates, unlike records in human-moderated Facebook groups that have strict posting rules. Records of GRT only came from a single locality (SWFR) whereas records for BNP came from three (SWFR, Palawan, and Zamboanga). Nonetheless, despite having records from three localities, the majority of BNP photos (86%) analyzed came from SWFR.

We identified 33 plant species from 21 families consumed by both parrot species, 73% of which were native to the Philippines (Table 4). The GRT consumed 14 plant species, of which eight were exclusively recorded in its diet. BNP fed on 25 species, with 19 recorded solely in its diet. Both parrots were observed feeding on six shared plant species: *Mangifera altissima, M. indica, Commersonia bartramia, Macaranga tanarius, Mezoneuron latisiliquum,* and *Cratoxylum sumatranum*. Fruits were the most documented plant part used for consumption, followed by flower/flower buds, leaves/ leaf buds, seeds, and bark (Image 3). Between the two parrots, only the GRT was recorded to consume leaf buds and seeds.

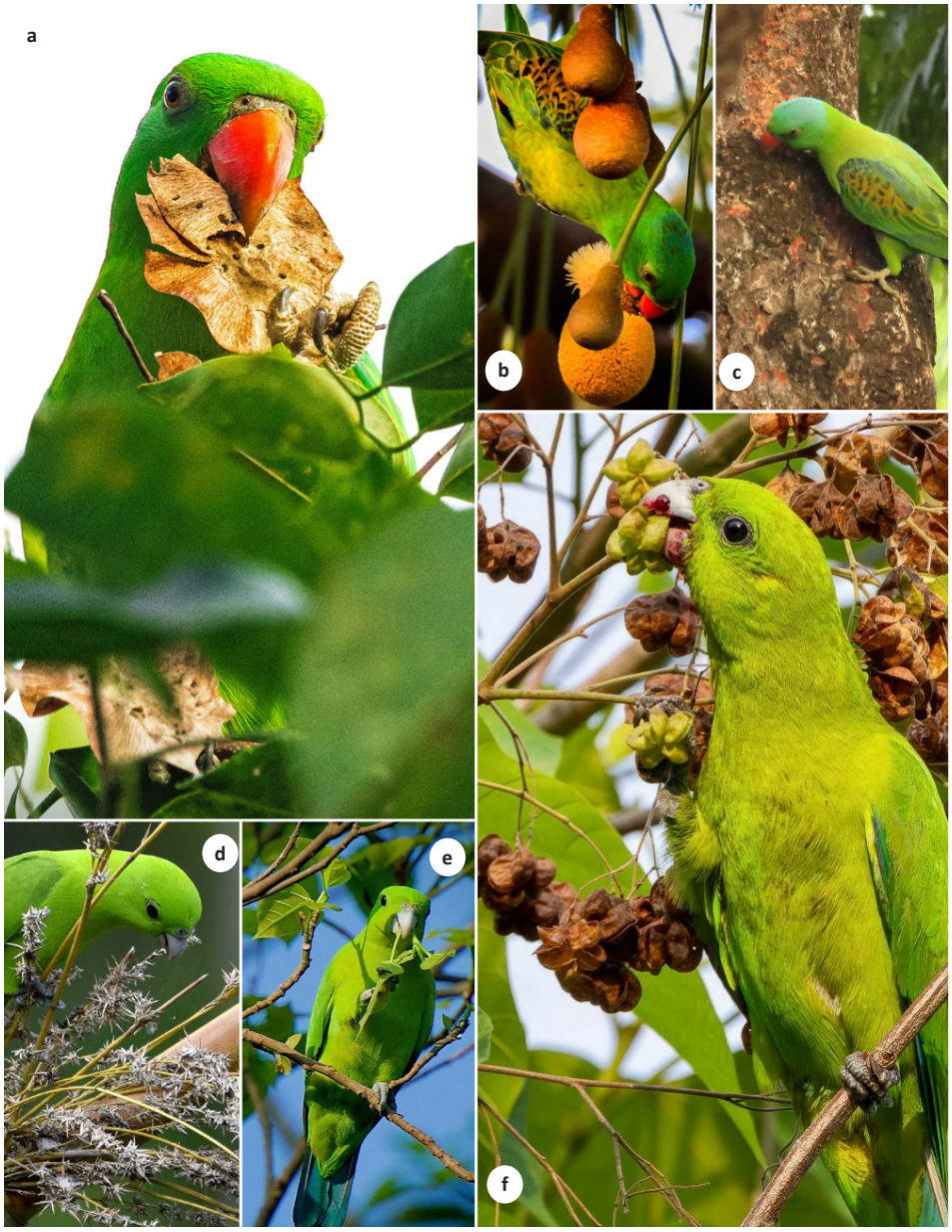

Image 3. Feeding records of parrots obtained through citizen science. Blue-Naped Parrot consuming: a—*Pterocarpus indicus* fruit | b—*Parkia timoriana* inflorescence | c—*Intsia bijuga* bark; Green Racquet-tail feeding on: d—bamboo seeds | e—*Ficus* sp. leaves | f—*Kleinhovia hospita* fruits. © a—Vinz Pascua | b—Caloy Dionela | c—Jorge De Ramos | d—Chris Chafer | e—Fidel Sy | f—Marilyn Gates.

Nesting Phenology

We analyzed 24 photos of GRT and 23 photos of BNP in various breeding-related activities or stages of development to construct the nesting phenology of the parrots. Photos were classified into five categories: Adult in/inspecting nest, copulating, nesting, juvenile spotted, and adult feeding young. GRT has been recorded inspecting or in nests during both the dry and wet seasons (Figure 2a). Consequently, juveniles have been observed in almost all months of the year. In contrast, breeding activities of the BNP were recorded only in the first half of the year, with copulation records coinciding with the dry season and sightings of juveniles recorded mostly towards or during the wet season (Figure 2a). These citizen science data agree with our field observations, which we have combined in Figure 2a.

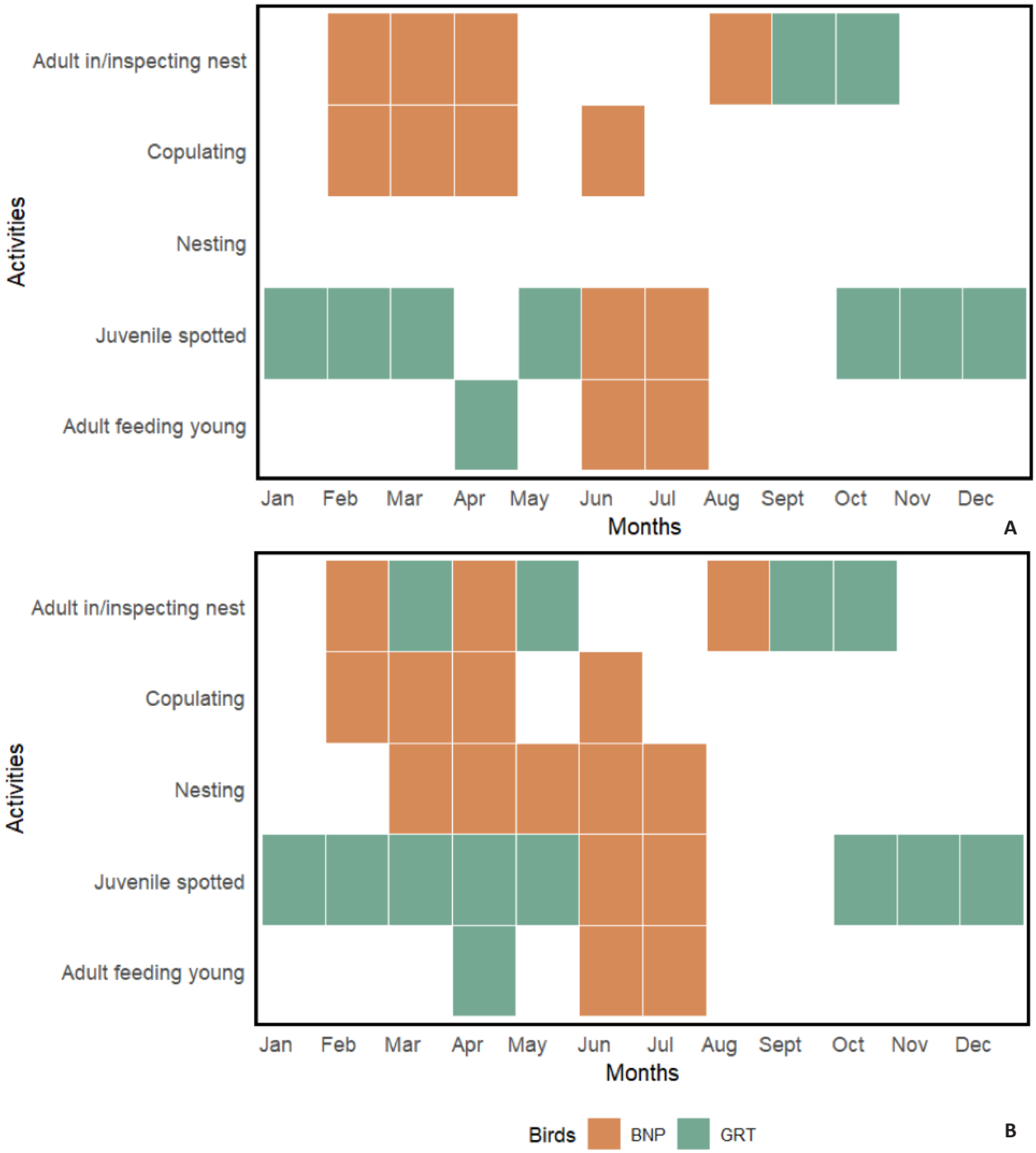

Figure 2. Nesting phenology of parrots constructed using: a—citizen science data | b—citizen science + field data.

DISCUSSION

Old World parrots are generally monogamous, with both parents contributing to chick-rearing activities (Billerman et al. 2020); however, some species exhibit complex breeding systems like polygynandry for the Greater Vasa Parrot *Coracopsis vasa* (Ekstrom et al. 2007) and polygynandry-polyandry for the Eclectus Parrot *Eclectus roratus* (Heinsohn 2008). Our findings suggest that BNP may potentially have a complex mating system, evident from observations of several visiting parrots that could either be mates or helpers. Parrots copulating with nesting females could also be different individuals; regrettably, our field methods did not allow for precise

Table 3. Feeding and breeding records of parrots obtained in different citizen science platforms.

Citizen science platform	GRT			BNP		
	Number of photos	Foraging	Breeding-related activities	Number of photos	Foraging	Breeding-related activities
eBird	195	3	0	512	12	0
Facebook- Birdwatch Community Philippines	83	8	9	118	11	5
Facebook- Wild Bird Photographers of the Philippines	79	8	8	95	22	8
Facebook- Philippine Bird Photography Forum-FB Group	19	1	7	48	13	6
Facebook- Wildlife Photographers of the Philippines	20	0	0	91	7	4
Facebook- Personal Public Post	1	1	0	2	2	0
Requested from Enthusiasts	6	6	0	12	12	0
Total	**403**	**27**	**24**	**878**	**79**	**23**

identification of individuals, despite our efforts to look for distinguishing marks or features from each visiting parrot. Future studies employing individual identification techniques are necessary to validate the species' mating system. Nonetheless, our observations of parrots partaking in multiple copulation events, males feeding the females through regurgitation, and biparental care are consistent with the typical reproductive behaviour of Old World parrots (Billerman et al. 2020). Sex roles appeared to be unequal, with most of the direct chick-rearing responsibilities undertaken by the female BNP. In addition, BNP exhibited an extended nesting period lasting ≥4 months, predominantly during the dry season. This observation agrees with the behaviour of other well-studied parrots such as the Lilac-Crowned Parrot *Amazona finsch* (≥ 3 months, Renton & Salinas-Melgoza 2004) and Cape Parrot *Poicephalus robustus* (3–4 months, Wirminghaus et al. 2001), possibly as a response to suitability in cavity-nesting conditions and resource availability (Ekstrom et al. 2007).

In contrast, the GRT appears to breed all year-round, with an observed brood size of two. The species may be reliant on woodpecker-excavated cavities in dead trees as nesting sites, natural cavities in live trees (Realubit et al. 2022; Gicaraya et al. 2025), or even cavities in arboreal epiphytic ferns (Walker & Seroji 2000). Both our field and citizen science data failed to locate nests of actively breeding racquet-tails, underscoring their highly elusive and inconspicuous nature, as well as their aversion to human disturbance (Vince Angelo G. Gicaraya pers. obs. 2022). They are also likely susceptible to the presence of more aggressive cavity users, such as the Coleto *Sarcops calvus*, Dollarbird *Eurystomus orientalis*, or even congeners, as evidenced by their displacement by Blue-crowned Racquet-tails *Prioniturus discurus* in parts of their range (BirdLife International 2024). Year-round nest surveys and telemetry studies may prove fruitful in elucidating the breeding biology of this species.

In terms of diet, our findings indicate that both parrots are mixed plant resource feeders, with BNP exhibiting a broader dietary range compared to GRT. Leaf and seed consumption by BNP was not recorded but may have occurred, possibly overlooked due to citizen scientists' limited ability to detect subtle feeding behaviours. Bark consumption was observed for both species but has not been reported yet for members of either genus. For well-studied parrots, this behaviour is often associated with foraging for invertebrates, sap, and cambium (O'Donnell & Dilks 1989; De Paula et al. 2017) or as a means to detoxify, digest, or absorb nutrients (de Araújo & Marcondes-Machado 2011). Moreover, it is worth noting that these parrots only consumed native plants (73% of records) from various plant families, underscoring the importance of native vegetation as food sources for native parrots. Nonetheless, both species were recorded consuming naturalized plants indicating a degree of dietary plasticity.

There are several caveats that should be considered when interpreting the results of this study. First, there is a geographic bias towards SWFR, as it is a popular and easily accessible birdwatching site for many enthusiasts. Second, although eBird contains numerous records, many lacked dates and were, therefore, unusable, particularly for analyzing nesting phenology. Third, although many of our findings agree with the behaviour of Old World parrots, increasing the number of nests for observation, along with the use of camera traps, could provide a sounder understanding of the species'

Table 4. Plant species consumed by parrots identified using citizen science.

Plant species	Conservation status	Family	Plant part	GRT	BNP		
				SWFR	SWFR	Palawan	Zamboanga
Buchanania arborescens	Native	Anacardiaceae	Fruit		x		
Mangifera indica	Native	Anacardiaceae	Fruit	x	x		
Mangifera altissima	Native	Anacardiaceae	Fruit	x	x		
Polyscias nodosa	Native	Araliaceae	Flower/peduncle		x		
Spathodea campanulata	Introduced	Bignoniaceae	Flower Bud		x		x
Garuga floribunda	Native	Burseraceae	Fruit			x	
Commersonia bartramia	Native	Byttneriaceae	Fruit	x	x		
Kleinhovia hospita	Native	Byttneriaceae	Fruit	x			
Calophyllum inophyllum	Native	Calophyllaceae	Fruit			x	
Trema orientale	Native	Cannabaceae	Fruit		x		
Casuarina equisetifolia	Native	Casuarinaceae	Fruit		x		
Terminalia catappa	Native	Combretaceae	Fruit				x
Coccinia grandis	Cryptogenic	Cucurbitaceae	Fruit		x		
Tetracera sp.	Native	Dilleniaceae	Flower Buds	x			
Endospermum peltatum	Native	Euphorbiaceae	Fruit		x		
Macaranga tanarius	Native	Euphorbiaceae	Fruit	x	x	x	
Melanolepis multiglandulosa	Native	Euphorbiaceae	Fruit		x		
Intsia bijuga	Native	Fabaceae	Bark		x		
Leucaena leucocephala	Introduced	Fabaceae	Flower Buds	x			
Mezoneuron latisiliquum	Native	Fabaceae	Fruit	x	x		
Parkia timoriana	Native	Fabaceae	Flower		x		
Pterocarpus indicus	Native	Fabaceae	Fruit		x		
Tamarindus indica	Introduced	Fabaceae	Fruit	x			
Cratoxylum sumatranum	Native	Hypericaceae	Fruit	x	x		
Gmelina arborea	Introduced	Lamiaceae	Fruit	x		x	
Unidentified	NA	Lamiaceae	Fruit		x		
Ficus sp.	Native	Moraceae	Leaf buds	x			
Psidium guajava	Introduced	Myrtaceae	Fruit		x		
Syzygium cumini	Introduced	Myrtaceae	Fruit	x			
Bambusa sp.	NA	Poaceae	Seeds	x			
Guioa sp.	Native	Sapindaceae	Fruit		x		
Pterocymbium tinctorium	Native	Sterculiaceae	Flower/Fruit		x	x	
Cissus repens	Native	Vitaceae	Fruit		x		
Unidentified	NA	NA	Bark	x			

breeding biology, particularly in estimating the nesting period and defining parental roles. Nonetheless, as a preliminary investigation, the current study was successful in four respects, in that it; 1) acquired a detailed account of the breeding biology of the BNP and its behaviour within and surrounding an active nest through field observations; 2) acquired insights on diet that could inform parrot-targeted habitat management; 3) constructed the nesting phenology of parrots using field and citizen science data; and 4) demonstrated how citizen science could supplement data from field observations and help acquire information on rare species, particularly when field observations are limited by time and resources. Our findings offer a valuable foundation for future research and conservation initiatives, particularly those aimed at enhancing feeding

opportunities for these rare and threatened parrots through habitat enrichment, development of nest protection measures, establishment of nest monitoring activities, and the meaningful engagement of citizen scientists in biodiversity research and conservation efforts.

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Filipino: Sa kabila ng kanilang popularidad at nanganganib na "conservation status", ang mga loro sa ilalim ng genus *Tanygnathus* at *Prioniturus* ay nananatiling kulang sa pag-aaral. Ang kanilang pagiging madalang at mailap ay balakid sa pagkalap ng komprehensibong datos tungkol sa kanilang ekolohiya. Sa pananaliksik na ito, aming inilalahad sa unang pagkakataon ang "breeding behavior", "diet", at "nesting phenology" ng Blue-naped Parrot *Tanygnathus lucionensis* at Green Racquet-tail *Prioniturus luconensis* gamit ang mga nakalap na obserbasyon sa ilang at mga citizen science databases. Isinagawa ang mga obserbasyon sa Subic Watershed Forest Reserve mula Pebrero-Hunyo 2022 at Marso-Agosto 2023. Batay sa aming mga datos, ang *T. lucionensis* ay may mahabang breeding period, paulit-ulit o maraming beses na pagtatalik, pagpapakain ng lalaki sa babae sa pamamagitan ng regurgitation, at pag-aalaga ng parehong magulang sa mga supling—mga katangiang naaayon sa gawi ng mga Old World parrots. Gayunpaman, walang natagpuang aktibong pugad ng *P. luconensis* sa panahon ng pag-aaral sa field. Bilang suplemento, sinuri namin ang 1,281 rekord ng mga lorong ito sa eBird at Facebook mula Enero 2012 hanggang Enero 2025. Aming napag alaman na ang *P. luconesis* ay nagpaparami buong taon, samantalang ang *T. lucionensis* naman ay sa mga buwan ng tag-init. Ang parehong loro ay kumpirmadong kumakain ng iba't ibang bahagi ng halaman, partikular na ng mga prutas, bulaklak, dahon, at maging balat ng puno. Kapansin-pansin na 73% ng mga rekord ay mula sa mga katutubong puno, pagpapatunay ng kahalagahan ng pagtatanim ng mga katutubong puno bilang mapagkukunan ng pagkain ng mga loro. Ang aming mga natuklasan ay nagbibigay ng mahalagang batayang impormasyon na maaring gamiting gabay para sa mga susunod na pananaliksik at mga programang pangkonserbasyon para sa mga ibong ito.

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