

Diet and Foraging Behaviour of the Blue-crowned Hanging Parrot *Loriculus galgulus* Amar-Singh HSS

Abstract

This review provides an update on the diet and foraging behaviour of the Blue-crowned Hanging Parrot in the region. Personal observations were supplemented with a literature search and use of citizen science via image databases. The Blue-crowned Hanging Parrot has a wide diet range with fruit and nectar appearing to be the primary food sources. Seeds, flowers, pollen and leaf food are also eaten, as are 'food bodies' of the *Macaranga* species. There is limited data on animal food sources except for gall feeding episodes. Some uncommon feeding behaviour is described. There is limited information on the diet of juveniles which may contain more animal prey.

Introduction

Blue-crowned Hanging Parrots *Loriculus galgulus* are found in forested lowlands from South Thailand, through Peninsular Malaysia and Singapore, Sumatra, Borneo, and some of the nearby islands (Juniper & Parr 1998; Collar & Boesman 2020). According to Forshaw (1977) they feed on nectar, fruits, seeds, blossoms and possibly small insects. Juniper *et al.* (1998) state that their diet contains flowers, buds, fruits, nuts, and seeds. Wells (1999) notes their diet includes the mesocarp of oil-palm fruits and a number of figs including *Ficus caulocarpa*, *F. virens*, *F. delosyae*, *F. pisocarpa*, *F. kerkenhovenii*, *F. crassiramea* and *F. stupenda*. He describes visits to flowers, possibly for nectar, but had no verification. Collar *et al.* (2020) mention that there are few specific records and lists the flowers of *Erythrina* and *Durio zibethinus* (durian) as part of the diet.

This report provides an update on the diet and foraging behaviour of the Blue-crowned Hanging Parrot.

Material and Methods

Observations were made at a number of forest reserves in Perak state, Peninsular Malaysia over the past 30 years. These include the Kledang-Sayong Forest Reserve, Ulu Kinta Forest Reserve, the foothills of Bukit Larut (Maxwell's Hill) in Perak, Malaysia and the surrounding secondary forest of these three areas.

Data was supplemented by a literature search, examination of Oriental Bird Images, eBird, Macaulay Library and Birds of the World databases, and an internet search for images and feeding reports. Feeding information from databases or online images was accepted if the bird was seen feeding directly in the image or in any description provided by the observer. Birds feeding in captivity were not included. More than 1,500 images and videos were reviewed. Care was taken to avoid repeat images in the different databases and online postings.

Plant identification was done using a variety of sources including Holttum *et al.* (1991), Polunin (1988), Gardner *et al.* (2015, 2016, 2018), Chin *et al.* (1988), Wee (2003), and Plants of the World Online (2019). In addition, numerous online sources were used to assist in the verification of individual plant species.

Results

Fruit and Seed Food Sources

Rambutan fruit *Nephelium lappaceum* is a common food source and observed often (Plate 1). The birds hang upside down to gain good access to the fruit, use the beak to break off small pieces of the skin and then take bites of the flesh of the fruit. On 30th December 2009 at the foothills of Bukit Larut I observed four Blue-crowned Hanging Parrots feeding at fruiting Rambutan trees. They were soon displaced by other birds who took over the feeding site. These included Greater Green Leafbirds *Chloropsis sonnerati* and Yellow-eared Spiderhunters *Arachnothera chrysogenys*; a form of kleptoparasitism. I have also observed Brown-throated Sunbird *Anthreptes malacensis* take over Rambutan fruit opened by Blue-crowned Hanging Parrots at the Ulu Kinta Forest Reserve on 11th September 2010. Birds have frequently been observed feeding on the mesocarp of Oil Palm fruit *Elaeis guineensis* (Plate 2).



Plate 1: Female Blue-crowned Hanging Parrot feeding on *Nephelium lappaceum* fruit, Taiping, Perak, Malaysia, 30 December 2009



Plate 2: Male Blue-crowned Hanging Parrot feeding on the mesocarp of Oil Palm fruit *Elaeis guineensis*, Sandakan, Sabah, Borneo, Malaysia, 2 May 2016

The Common Mahang *Macaranga bancana*, a fast-growing tree of secondary forest that has a mass-production of deep purple-red fruits (10–11 mm in size) twice a year, attracts a wide range of birds including Blue-crowned Hanging Parrots. They also feed on the fruit of the Giant Mahang *M. gigantea* (fruits measure 7 mm in diameter) and *M. tanarius* (fruit measure 9–10 mm in size with one black seed 5 mm in diameter) both of which also attract many other bird species.

All fruit food sources identified from personal observations and literature/image search are summarised in Table 1.



Table 1: Fruits and seed food sources of the Blue-crowned Hanging-Parrot

Scientific Name of Plant	Common Name of Plant	Comment on Feeding Technique	Location	Source
<i>Ficus caulocarpa</i> , <i>F. virens</i> , <i>F. delosyce</i> , <i>F. pisocarpa</i> , <i>F. kerkenhovenii</i> , <i>F. crassiramea</i> and <i>F. stupenda</i>	Ficus or Fig Trees	Biting small pieces of flesh off to feed	Peninsular Malaysia	Wells (1999), Happ (Flicker 2012), Wheatley (ML 2016), Kinard (Flicker 2016), Smith (ML 2018)
<i>Nephelium lappaceum</i>	Rambutan	Bite open a small hole and then work around that to get to the fruit flesh	Peninsular Malaysia; Borneo; Singapore	Pers obs. (2008, 2009), Hassie (Flicker 2011), O'Neill (2012a), Irving (Flicker 2013), Yap (2014), Wee (2015), De Win Lim (Flicker 2015), (ML 2016), Wee (Flicker 2016), Ong (MNS Perak Bird Group, 2017), Ishak (Flicker 2018), Lee (Flicker 2019)
<i>Elaeis guineensis</i>	Oil Palm	Feeds on mesocarp; may use the foot to assist	Borneo; Peninsular Malaysia; Singapore	Pers obs. (2016), Wee (2007a), Kee (Flicker 2009), Lee (Flicker 2009), Yap (2014), Jearwattananok (ML 2018)
<i>Macaranga bancana</i>	Common Mahang		Peninsular Malaysia	Pers obs. (2011), Chan (OBI 2003), Sharif (Flicker 2014), ATeng (Flicker 2018), Fuller (ML 2019), Brooks (ML 2019), Callaghan (ML 2019), Koay (Flicker 2019)
<i>Macaranga gigantea</i>	Giant Mahang		Peninsular Malaysia	Pers obs. (2012), Ooi (2001), Adler (Flicker 2016)
<i>Macaranga tanarius</i>		Feeding on fruit and seed	Peninsular Malaysia; Thailand	Pers obs. (2020), Padungtin (Flicker 2019), Chantasuban (Flicker 2011)
<i>Rhopaloblaste ceramica</i>	Ceram Palm	Bites off pieces of the pulp	Singapore	Wee (2005)
<i>Psidium guajava</i>	Guava	Larger upper hooked mandible will anchor on the fruit while it's lower mandible will scrape off small pieces of flesh; eats mainly the outer core of the fruit; does not eat the seeds	Singapore	Lam (2007), Pooi (2008), Ng (Flicker 2008), Goh (2012), Khor (Flicker 2013)
<i>Psidium spp.</i>			Malaysia	Chong (Flicker 2010)
<i>Syzygium spp.</i>	Roseapple, Water Apple or Jambu		Borneo; Singapore; Peninsular Malaysia	Todd (ML 2016), Lim (Flicker 2017), Chew (Flicker 2017), Tang (ML 2017), Hooi (MNS Perak Bird Group, 2018), MyBIS (2020)
<i>Manikara zapota</i>	Sapodilla or Chiku		Singapore	Goh (2012)



Scientific Name of Plant	Common Name of Plant	Comment on Feeding Technique	Location	Source
<i>Mangifera spp.</i>	Mango		Singapore	Sandhu-Chin (2010), Ling (Flicker 2012), Loei (2013), Wee (Flicker 2013), Johnson (Flicker 2013), Leong (Flicker 2016)
<i>Spathodea campanulata</i>	African Tulip Tree		Singapore	Strange (2017)
<i>Trema tomentosa</i>	Rough Trema		Peninsular Malaysia	Adler (Flicker 2016)
<i>Averrhoa carambola</i>	Starfruit		Peninsular Malaysia	Parker (ML 2006)
<i>Muntingia calabura</i>	Village Cherry		Indonesia	Goenarto (ML 2016)
<i>Casuarina equisetifolia</i>	Casuarina Tree	Feeds on the seeds	Singapore	Cheong (Flicker 2010), Boracayangels (Flicker 2010)
<i>Terminalia brassii</i>			Malaysia	Koh (Flicker 2017)

Key ML = Macaulay Library, OBI = Oriental Bird Images, Pers obs. = personal observation

Note: There are a number of observations of birds feeding on papaya and apple fruit but all of these reports are of staged feeding sites where the fruit has been cut and offered at a bird feeder.

Nectar, Flowers, Pollen and Leaf Food Sources

A number of individuals have observed Blue-crowned Hanging Parrots feeding on nectar, eating flowers and feeding on pollen and young leaves. Two mistletoe species have been documented for nectar feeding from Singapore; *Macrosolen cochinchinensis* (Wee & Chan 2007b; Koh, Flicker 2007) and the Malayan Mistletoe *Dendrophthae pentandra* (Loke 2017; Yap, OBI 2005; Wokoti, Flicker 2010). Both these mistletoe species have adapted to have flowers that only open when visited by birds; so-called 'exploding flowers' (Ladley 1997). Wee *et al.* (2007b) described it as "When a bird grasps the flower bud, the petals suddenly unfold to expose the stamens and style. At the same time pollen is probably discharged from the anthers on to the bird. The bird helps itself to the nectar and at the same time assists in the pollination of the flower."

Chan (2012), Cheah (Flicker 2015), Khor (Flicker 2015) and Ng (Flicker 2016) observed the parrots feeding on the nectar of the Golden Penda *Xanthostemon chrysanthus*, a plant that originates from the rainforests in the north-east of Australia and is extensively planted in Singapore. The nectar of *Syzygium grande* is a particular favourite and many birds can be seen feeding when a tree is flowering (Plate 3).

There have been a number of reports of these parrots eating flowers. Chung (2016), Ng (Flicker 2014), KT (Flicker 2016), Gan (Flicker 2016) observed Golden Shower (*Cassia fistula*) flowers being eaten, Wee (2015) noted Alexandra Palm *Archontophoenix alexandrae* flowers, and Sun (2013) Yellow Flame tree *Peltophorum pterocarpum* flowers being consumed. It has been assumed that the birds eat flowers to get to the nectar. However, there may be other possible reasons like obtaining trace elements, vitamins, antioxidants, antimicrobial, or when conventional food sources are limited.



Plate 3: Male Blue-crowned Hanging Parrot feeding on the nectar of *Syzygium grande*, Taiping, Perak, Malaysia, 01 February 2024

Ng (2011) included pollen as a food source in the diet of the species. Finlay (ML 2018) saw pollen taken from the Golden Shower *Cassia fistula*. Yap (2014) documented feeding on the pollen of the African Tulip Tree *Spathodea campanulata* and also attempts to break into unopened flowers for the copious nectar the flowers produce. Lim (Flicker 2011) observed feeding on unopened buds of the African Tulip Tree. Nectar, flower, pollen and leaf food sources identified are summarised in Table 2.

Table 2: Nectar, flower, pollen and leaf food sources of the Blue-crowned Hanging-Parrot

Scientific Name of Plant	Common Name of Plant	Food Item	Location	Source
<i>Erythrina spp.</i>	Coral Tree	Nectar and pollen	Indonesia; Singapore	Juniper <i>et al.</i> (1998), Perdana (OBI 2010), Kee (Flicker 2011)
<i>Durio zibethinus</i> <i>Durio spp.</i>	Durian	Nectar	Malaysia	Juniper <i>et al.</i> (1998), Ishak (Flicker 2016)
<i>Macrosolen cochinchinensis</i>		Nectar	Singapore	Wee <i>et al.</i> (2007b), Koh (Flicker 2007)
<i>Dendrophthae pentandra</i>	Malayan Mistletoe	Nectar	Singapore	Yap (OBI 2005), Wokoti (Flicker 2010), Loke (2017)
<i>Callistemon spp.</i>	Bottlebrush	Nectar	Singapore	KayBSteve (Flicker 2013), Ng 2014 (Flicker)



Scientific Name of Plant	Common Name of Plant	Food Item	Location	Source
<i>Syzygium spp.</i> (including <i>S. grande</i>)		Nectar	Malaysia; Singapore	Pers obs. (2024), Melling (Flicker 2011), Fadzrun (ML 2017), Ng (Flicker 2017), Fadzrun (ML 2018), Finlay (ML 2019)
<i>Tabebuia rosea</i> (<i>T. pentaphylla</i>)	Trumpet Tree or Tecoma	Possibly nectar robbing technique at base of flower	Singapore	Ong (Flicker 2016), Alan (Flicker 2017), Naden (Flicker 2018)
<i>Malvaviscus arboreus</i>	Wax Mallow or Ladies Teardrop	Nectar robbing technique	Singapore	Kee (Flicker 2011, 2013)
<i>Poikilospermum suaveolens</i>		Feed on the flowers to get to the nectar	Borneo; Peninsular Malaysia	AlanYWM (Flicker 2012); Beadle (Flicker 2011); Naden (Flicker 2018); Goh (2019)
<i>Cassia fistula</i>	Golden Shower	Flowers	Singapore	Chung (2016), Ng (Flicker 2014), KT (Flicker 2016), Gan (Flicker 2016)
<i>Cassia spp.</i>		Flowers or nectar	Singapore	Burtner (ML 2018)
<i>Archontophoenix alexandrae</i>	Alexandra Palm	Flowers	Singapore	Wee (2015)
<i>Adonida merrillii</i>	Manila Plam	Flowers	Singapore	Seow (Flicker 2007), Tan (Flicker 2011), Ichiyama (ML 2018)
<i>Cocos nucifera</i>	Coconut Tree	Flowers	Malaysia	Naden (Flicker 2015)
<i>Peltophorum pterocarpum</i>	Yellow Flame tree	Flowers	Singapore	Sun (2013), Lim (Flicker 2016)
<i>Tamarindus indica</i>	Tamarind	Flowers and young leaves	Singapore	Noob (Flicker 2013), Naden (Flicker 2015)
<i>Callerya atropurpurea</i> (<i>Millettia atropurpurea</i>)	Purple Millettia	Flowers (possibly also nectar)	Singapore	Budihardjo (Flicker 2011), Ghosh (OBI 2014)
<i>Spathodea campanulata</i>	African Tulip Tree	Pollen & Unopen Buds	Singapore	Yap (2014), Lim (Flicker 2011)
<i>Cassia fistula</i>	Golden Shower	Pollen (eating stamens)	Singapore	Finlay (ML 2018)

Key: ML = Macaulay Library, OBI = Oriental Bird Images

Note: Feeding was noted on 8 other nectar, flower and leaf food sources that were not identified.

Animal Prey

Although said to take animal prey by some sources, there are limited records of this. Kwong (2012) documents feeding on caterpillars. Also see below under feeding on gall growths.

Less Well Understood Food Sources and Feeding Behaviour

There are a number of feeding observations that are not well understood and are described in this section.

Blue-crowned Hanging Parrots were observed on 30th December 2009 at the foothills of Bukit Larut (Maxwell's Hill) and on 30th January 2010 at the Ulu Kinta Forest Reserve feeding on moss covered dead branches (Plate 4). The birds would bite hard into the moss covering the branch, 'digging' with their strong beaks for long durations, and feed on what was 'unearthed'. Having observed this behaviour a number of times on dead and living trees, I considered the

possibility of feeding on burrowing insects, tree sap, or eating vegetable matter for medicinal value. According to Collar (1997), pygmy-parrots *Micropsitta* spp. glean trunks and branches of trees principally for lichens, "...shuffling along the tops of limbs and frequently bobbing the head around the side of a branch, picking up small objects from the bark surface or flaking off pieces of bark and consuming the items thus exposed." Forshaw (1973) similarly reports pygmy-parrot feeding on lichens and fungus. It is possible that Blue-crowned Hanging Parrots may be foraging for lichens and/or fungus. I have observed similar feeding behaviour locally by the Long-Tailed Parakeets *Psittacula longicauda*. A variation of this behaviour has been observed when the branch has no moss and the birds bite into the bark or stem, especially coconut stems (O'Neill 2012b; Yen, OBI 2014; MyBIS 2020).



Plate 4: Composite of a female Blue-crowned Hanging Parrot feeding on a moss covered dead branch, Taiping, Perak, Malaysia, 30 December 2009

A second uncommon feeding behaviour is on the gall growths on leaves. On 9 August 2015 at the Kledang-Sayong Forest Reserve I observed Blue-crowned Hanging Parrots feeding on growth present on the leaves of the *M. gigantea* (Plate 5). These galls or abnormal outgrowths are often caused by the larvae of insects and mites, possibly Gall Midges (Family *Cecidomyiidae*). This may be a source of animal protein. Other gall feeding episodes have been documented from Singapore by TeocMeng (Flicker 2010), Allnt (Flicker 2011), Chan (2012), Chow (2014) and Ng (Flicker 2017).

A third, yet undescribed food source, is the 'food bodies' offered by *Macaranga* species. On 1st June 2020, at the Ulu Kinta Forest Reserve, I observed juvenile birds not just eating the fruit of the *M. tanarius* but also 'biting' into or licking the stem of the plant and the under-surface of stipules (Plate 6). The *Macaranga* species often form symbioses with ant (*Formicidae*) species (particularly *Crematogaster* ants of the subgenus *Decacrema*). The trees provide 'nectar' or food bodies (also called starchy bodies) and benefit because the ants attack herbivorous insects. These food bodies are cellular structures produced by the plant and contain large amounts of lipids, proteins and carbohydrates (Linsenmair 2001). There are two groups of myrmecophilic *Macaranga*. One group are obligate myrmecophytes and house specific ant colonies in their hollow shoots. The other group have a facultative myrmecophilic strategy and offer food bodies on the under-surface of stipules or on leaf blades to ants. *M. tanarius* has a facultative myrmecophilic strategy with food bodies hidden under re-curved stipules or on the leaf blades of the plant; food bodies in *M. tanarius* are largely carbohydrate based.

One final feeding behaviour is apparent 'alcoholism', with Blue-crowned Hanging Parrots known to steal palm toddy from collection pots placed over the palm inflorescences and becoming intoxicated (Wee 2005).



Plate 5: Juvenile Blue-crowned Hanging Parrot feeding on leaf galls of the *M. gigantea*, Kledang-Sayong Forest Reserve, Ipoh, Perak, Malaysia, 9 August 2015



Plate 6: Juvenile Blue-crowned Hanging Parrot feeding on food bodies of the *M. tanarius*, Ulu Kinta Forest Reserve, Ipoh, Perak, Malaysia, 1 June 2020

Foraging Behaviour

The commonest feeding behaviour noted in the majority of observations are birds hanging upside down to feed. Birds will at time also hold the fruit or seed in one foot to aid feeding. Juveniles are fed by regurgitating feeds. A number of observations of juveniles being fed (Damodaran, Flicker 2018; Low, Flicker 2019; Luanluanpai, Flicker 2018) show regurgitation of feeds in a thick liquid paste, possibly nectar; one image suggests regurgitation of Mango *Mangifera* species.

Discussion

This review has highlighted the wide diet range of the Blue-crowned Hanging Parrot. A sizeable number of observations are from Singapore, as the bird visits gardens in the city-state and lends to easier observation. The list of food sources presented here is possibly a limited selection of all those taken, as those in the forest are less often observed.

Fruit and nectar appear to be the primary food sources. Seeds, flowers, pollen and leaf food are also eaten, as are 'food bodies' of the *Macaranga* species. There is limited data on animal food sources except for gall feeding episodes.

More observation is required regarding prey for juveniles which are likely to have a greater animal component.

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