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# TREUBIA

*A JOURNAL ON ZOOLOGY  
OF THE INDO-AUSTRALIAN ARCHIPELAGO*

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December 2020



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## TREUBIA

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## TREUBIA

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UDC: 593.4:595.35(594)

Pipit Pitriana

### Exploring sponge-inhabiting barnacles of eastern Indonesia using micro-CT scanning

TREUBIA, December 2020, Vol. 47, No. 2, pp. 77–98.

We present a morphological study of Indonesian sponge-inhabiting barnacles using standard light microscopy in combination with micro-CT scanning and computer-aided 3D-reconstruction of the external shell morphology. A taxonomic analysis of the material detected four different genera of sponges inhabited by five different species of balanomorph barnacles, two of which are undescribed. Together with conventional morphological examination by dissection, we provide modern non-destructive imaging methods, using micro-CT scanning to enhance our knowledge of the morphological characters of sponge-inhabiting barnacles from eastern Indonesia. Although there were some methodological limitations regarding the contrast-enhancing technique, this study demonstrates micro-CT as a useful non-destructive technique of integrative taxonomy, for the examination of sponge-inhabiting barnacles.

(Pipit Pitriana, Andreas Wessel, Tina Aschenbach, and Kristina von Rintelen)

**Keywords:** Cirripedia, Indonesian biodiversity, integrative taxonomy, micro-computer tomography, shell morphology

UDC: 598.89:577.2

Jarulis

### Characters of mitochondrial DNA D-loop hypervariable III fragments of Indonesian Rhinoceros Hornbill (*Buceros rhinoceros*) (Aves: Bucerotidae)

TREUBIA, December 2020, Vol. 47, No. 2, pp. 99–110.

The Rhinoceros Hornbill (*Buceros rhinoceros*) genetic characteristics consist of nucleotide polymorphisms, haplotypes, genetic distances, and relationships which are important for their conservation effort in Indonesia. We sequenced mitochondrial DNA D-loop hypervariable III fragments from five Rhinoceros Hornbill individuals at Safari Park Indonesia I and Ragunan Zoo, which were isolated using Dneasy® Blood and Tissue Kit Spin-Column Protocol, Qiagen. D-loop fragment replication was done by PCR technique using DLBuce F (5'-TGGCCTTTCTCCAAGGTCTA-3') and DLBuce R (5'-TGAAGG AGTTCATGGGCTTAG-3') primer. Thirty SNP sites were found in 788 bp D-loop sequences of five Rhinoceros Hornbill individuals and each individual had a different haplotype. The average genetic distance between individuals was 3.09% and all individuals were categorized into two groups (Group I: EC6TS, EC1RG, EC2TS and Group II: EC9TS, EC10TS) with a genetic distance of 3.99%. This result indicated that the two groups were distinct subspecies. The genetic distance between Indonesian and Thai Rhinoceros Hornbills was 10.76%. Five Indonesian Rhinoceros Hornbill individuals at Safari Park Indonesia I and Ragunan Zoo probably came from different populations, ancestors, and two different islands. This study can be of use for management consideration in captive breeding effort at both zoos. The D-loop sequence obtained is a

useful character to distinguish three Rhinoceros Hornbill subspecies in Indonesia.

(Jarulis, Choirul Muslim, Dedy Duryadi Solihin, Ani Mardiasuti, and Lilik Budi Prasetyo)

**Keywords:** Bucerotidae, control region, phylogenetic, Rhinoceros Hornbill conservation, zoo

UDC: 595.773.4(594.59)

Eka Kartika Arum Puspita Sari

**Diversity of fruit flies (Tephritidae: *Bactrocera* spp.) in campus C of Airlangga University, Surabaya, Indonesia**

TREUBIA, December 2020, Vol. 47, No. 2, pp. 111–122.

This research aims to get information about the species of host plants and fruit flies, composition and structure of community, distribution pattern, and impact of environmental factors to fruit flies in Campus C, Airlangga University. Research was conducted from August to November 2019. A modification of Steiner trap with methyl eugenol 1.5 ml bait was installed in nine sites. Each Steiner trap was placed on a mango tree 1-2 meters above ground level. Trapped fruit fly specimens were collected after one week. Four replications were made, with intervals between two periods of installation. As many as 682 host plants of the fruit flies were found at the study site consisting of 25 species from 15 families. Results showed that 1121 individuals of *Bactrocera* fruit flies were found, consisting of 5 species, namely *B. carambolae*, *B. dorsalis*, *B. minuscula*, *B. occipitalis*, and *B. musae*. The most abundant species was *B. carambolae* (62.8%), followed by *B. dorsalis* (27.3%), *B. minuscula* (8.4%), *B. occipitalis* (1%), and the lowest was *B. musae* (0.5%). *B. occipitalis* has an even distribution pattern, while four other species have aggregated distribution patterns. The diversity index at nine locations ranged from 0.772 (low) to 1.151 (moderate). *B. carambolae* and *B. dorsalis* were the dominant species. The presence of fruit flies was influenced by environmental (humidity, temperature, sunlight intensity, wind) and host plant factors.

(Eka Kartika Arum Puspita Sari, Moch. Affandi, and Sucipto Hariyanto)

**Keywords:** Dacinae, diversity, fruit flies, methyl eugenol, Steiner trap

UDC: 595.799:598.836:591.5(594.5)

Sih Kahono

**First report on hunting behavior of migratory Oriental Honey-buzzard (*Pernis ptilorhynchus orientalis*) towards migratory giant honeybee (*Apis dorsata dorsata*) (Hymenoptera: Apidae) on Java Island, Indonesia**

TREUBIA, December 2020, Vol. 47, No. 2, pp. 123–132.

Both migratory Oriental Honey-buzzard (*Pernis ptilorhynchus orientalis*) and migratory giant honeybee (*Apis dorsata dorsata*) can be found in South-east Asia. The Oriental Honey-buzzard is the main predator of the giant honeybee, prey upon its honeycomb, larvae, and honey. Its existence always follows the migration of the giant honeybee. They stay on Java island during the migratory season. The giant honeybee lives in a large colony and has a powerful sting that is useful for defence against its predators. The bee is among the most dangerous animals since its threatening defensive behavior causes severe impact on the eagle and is even frequently fatal for human beings. Data collections on hunting behavior of the Oriental Honey-buzzard were based on irregular observations and interviews between the year 2003 to 2019. We categorized five hunting behaviors during data collections: flying orientation around the bee's nest, attack on living nest, failure to collect the living nest, preying upon the newly empty nest, and transferring attack of the angry bee to people nearby. The safest hunting for the Oriental Honey-buzzard is to prey upon newly empty nest left by the honeybee. When the nest was still occupied by the bee colonies, the eagle should develop a strategy to avoid and reduce the risk of being attacked. It sometimes transfers the attack to people nearby.

(Sih Kahono, Dewi M. Prawiradilaga, Djunijanti Peggie, Erniwati, and Eko Sulistyadi)

**Keywords:** hunting behavior, Java, migratory giant honeybee, Oriental Honey-buzzard

UDC: 595.798:57.06(594.4)

Fuki Saito-Morooka

**Taxonomic notes on the hover wasp genus *Eustenogaster* (Vespidae, Stenogastrinae), with description of two new species from Sumatra Island, Indonesia**

TREUBIA, December 2020, Vol. 47, No. 2, pp. 133–154.

Wasps of the genus *Eustenogaster* van der Vecht, 1969, with 17 species currently recognized, are distributed from the Indian subcontinent in the west to the Philippines, Sulawesi Island and Java Island in the east. Two new species of hover wasp genus *Eustenogaster* (*E. multifolia* sp. nov., *E. sumatraensis* sp. nov.) are described from specimens collected in Sumatra Island. The female of *E. vietnamensis* occurring in Vietnam are described for the first time. The lectotypes of *Paravespa eva* Bell, 1936 and *Ischnogaster ornatifrons* Cameron, 1902 are designated. The new taxonomic status is proposed for *Stenogaster eximioides* Dover and Rao, 1922 as a good (=valid) species of *Eustenogaster*. The synonymy of *Ischnogaster ornatifrons* Cameron, 1902 with *Eustenogaster micans* (de Saussure, 1852) has been confirmed. A revised key to species and a taxonomic and distributional checklist of all the species of *Eustenogaster* are provided.

(Fuki Saito-Morooka, Hari Nugroho, Alan Handru, and Jun-ichi Kojima)

**Keywords:** distributional checklist, lectotype, new status, revised key, synonym

**FIRST REPORT ON HUNTING BEHAVIOR OF MIGRATORY ORIENTAL HONEY-BUZZARD (*PERNIS PTILORHYNCHUS ORIENTALIS*) TOWARDS MIGRATORY GIANT HONEYBEE (*APIS DORSATA DORSATA*) (HYMENOPTERA: APIDAE) ON JAVA ISLAND, INDONESIA**

**Sih Kahono<sup>\*1</sup>, Dewi M. Prawiradilaga<sup>1</sup>, Djunijanti Peggie<sup>1</sup>, Erniwati<sup>1</sup>, and Eko Sulistyadi<sup>1</sup>**

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**ABSTRACT**

Both migratory Oriental Honey-buzzard (*Pernis ptilorhynchus orientalis*) and migratory giant honeybee (*Apis dorsata dorsata*) can be found in South-east Asia. The Oriental Honey-buzzard is the main predator of the giant honeybee, prey upon its honeycomb, larvae, and honey. Its existence always follows the migration of the giant honeybee. They stay on Java island during the migratory season. The giant honeybee lives in a large colony and has a powerful sting that is useful for defence against its predators. The bee is among the most dangerous animals since its threatening defensive behavior causes severe impact on the eagle and is even frequently fatal for human beings. Data collections on hunting behavior of the Oriental Honey-buzzard were based on irregular observations and interviews between the year 2003 to 2019. We categorized five hunting behaviors during data collections: flying orientation around the bee's nest, attack on living nest, failure to collect the living nest, preying upon the newly empty nest, and transferring attack of the angry bee to people nearby. The safest hunting for the Oriental Honey-buzzard is to prey upon newly empty nest left by the honeybee. When the nest was still occupied by the bee colonies, the eagle should develop a strategy to avoid and reduce the risk of being attacked. It sometimes transfers the attack to people nearby.

**Keywords:** hunting behavior, Java, migratory giant honeybee, migratory Oriental Honey-buzzard

**ABSTRAK**

Burung elang sesap madu (*Pernis ptilorhynchus orientalis*) dan lebah madu hutan (*Apis dorsata dorsata*) dijumpai di Asia Tenggara. Burung elang ini merupakan predator utama lebah hutan, memangsa sarang tempat madu, anakan, dan madu. Keberadaan elang ini mengikuti migrasi lebah madu tersebut. Kedua jenis ini berada di Pulau Jawa selama musim migrasi. Lebah madu ini hidup dalam koloni yang anggotanya sangat banyak dan memiliki sengat yang kuat yang berguna dalam pertahanan diri terhadap pemangsa. Lebah ini termasuk di antara satwa yang paling berbahaya karena perilaku defensif yang bermacam dan dapat menyebabkan dampak pada burung elang dan bahkan seringkali fatal bagi manusia. Pengumpulan data perilaku perburuan burung elang sesap madu ini didasarkan pada observasi tak berkala dan wawancara yang dilakukan antara tahun 2003 sampai 2019. Kami mengategorikan lima perilaku perburuan selama pengumpulan data: terbang orientasi sekitar sarang lebah, penyerangan sarang aktif, kegagalan mengumpulkan sarang aktif, pemangsaan sarang kosong yang baru ditinggalkan, dan pengalihan lebah marah untuk menyerang orang yang di dekatnya. Perburuan yang paling aman bagi burung elang adalah dengan memangsa sarang kosong yang baru ditinggalkan lebah. Ketika sarang masih dihuni oleh koloni lebah, burung elang itu harus mengembangkan strategi untuk menghindari dan mengurangi risiko terserang oleh lebah. Burung elang itu terkadang mengalihkan serangan pada orang yang saat itu berada di sekitarnya.

**Kata kunci:** perilaku perburuan, Jawa, lebah madu hutan, burung elang sesap madu

## INTRODUCTION

Indonesian region is visited by many species of fauna during the migratory season every year, for example, the Oriental Honey-buzzard (*Pernis ptilorhynchus orientalis*) and the giant honeybee (*Apis dorsata dorsata*). The Oriental Honey-buzzard is a medium size raptor with a length of approximately 53-65 cm (Fergusson-Lees & Christie, 2001). The feathers are blackish brown with a small crest on its head. Large numbers of this species migrate annually from Siberia and Japan to Indonesia, especially to Java and Bali islands (Ash, 1993; Prawiradilaga et al., 2003; Nijman, 2004; Germi & Waluyo, 2006). They may arrive between August (MacKinnon & Phillipps, 2010) and November (Suparman, 2020; personal communication) and will leave between February and April (Higuchi, 2016). During the migration period, the Oriental Honey-buzzard usually stays on trees in the forest, cultivated areas (Fergusson & Christie, 2001) or around suburban areas with tall trees (Kahono et al.; unpublished data). Together with some mammals, the eagle is recorded as one of the most important natural enemies of the migratory honey bee *Apis dorsata* F. The eagle feeds on brood, honey, pollen, and adult of the bee (Oldroyd & Wongisiri, 2006; Koeniger et al., 2010).

*Apis dorsata* is a social honeybee living in the wild and has not been successfully cultivated yet (Hadisoesilo & Kuntadi, 2007; Kahono et al., 2018). The bee is called the giant honey bee because the bee is the biggest in both body size and colony members within the species of honeybees. They build a single large comb in open (Ruttner, 1988) with huge colony members under branch and rock or part of the building (Batra, 1977; Seely et al., 1982; Dyer & Seely, 1991; Kahono et al., 1999). The species is a well-known long-distance traveler and a seasonal migrant between geographically discrete sites (Dyer & Seely, 1994). In Indonesia, the bee consist of two subspecies, namely *Apis dorsata binghami* endemic to Sulawesi and its surrounding islands and *A. d. dorsata* distributed to the western part of Wallacean line from Sumatra, Kalimantan, Java, Bali, Lombok to Timor and eastward to the Kai Islands (Otis, 1991). Recently, *A. d. dorsata* was also recorded in Sermata and Ambon islands across the Wallacean line (Bob Lamerkabel, personal communication). Nesting aggregation of *A. d. dorsata* is common (Otis, 1991). Nesting colony aggregation is frequently observed in conserved areas, while solely colonies are found in other areas of Java (Kahono et al.; unpublished data).

*Apis dorsata dorsata* immigrate to Java during a certain period of the beginning of dry season until the beginning of the wet season and sometimes until the early successive year

(Kahono et al., 1999). During their migration, the bees develop their colony with a huge number of broods, honey, and bee pollen, nutritious food for the eagle. The honeybees leave empty bee's nests at the end of their stay. A few colonies of the bee sometimes stay within certain habitats and do not conduct long distance migration that local people called "lebah pribumi" or localized bee (Kahono et al.; unpublished data).

Although monitoring activities on the Oriental Honey-buzzard (Ash, 1993; Prawiradilaga et al., 2003; Nijman, 2004; Germi & Waluyo, 2006) as well as on the giant honeybee (Kahono et al., 1999; Kahono et al., unpublished data) have been carried out on Java island, the interaction of those two species as predator and prey has never been reported. The aims of the study were to explore hunting behaviors of the Oriental Honey-buzzard towards the giant honeybee during the migratory season on Java island and to confirm the impact of those behaviors on people as a strategy of the Oriental Honey-buzzard to avoid the fatal sting of the giant honeybee.

## **MATERIALS AND METHODS**

### **Study area**

The research on the hunting behavior of the migratory Oriental Honey-buzzard was done as a complement to monitoring activities of the migratory giant honeybee between 2003 and 2019. It was conducted in 16 selected locations on Java island: West, Central, and East Java provinces (Table 1). In most locations, the number of data collections ranged between 1 and 5. The highest number of data collections was in the Bogor Botanic Garden since this area was ideal and the most accessible for studying both species.

### **Data collection**

Data collections were carried out by direct observations and interviews between 2003 and 2019 (Table 2), including collecting reported cases of human victims caused by the fatal sting of the angry giant honeybee. Binocular and camera were used to observe the Oriental Honey-buzzard and the nesting colony of the giant honeybee. Interviews were conducted with local people and honey collectors who experienced seeing the behavior of the Oriental Honey-buzzard towards the giant honeybee colony, especially in transferring the attack of the angry giant honeybee to people nearby.

**Table 1.** Frequency of data collections in the study area (2003-2019)

No.	Location	No. of data collections
1	Ujung Kulon National Park, Pandeglang, Banten	3
2	Halimun-Salak NP, Nanggung, Bogor, West Java	4
3	Gunung Pancar, Bogor, West Java	5
4	Rural areas of Sukaraja, Bogor, West Java	2
5	Rural areas of Sukamantri, Ciomas, Bogor, West Java	2
6	Bogor Botanical Garden, Bogor, West Java	18
7	Cibinong Science Center, CSC LIPI	1
8	Rural areas of Bumiwangi, Pelabuhan Ratu, Sukabumi, West Java	3
9	Rural areas of Kertamandala, Panamatan, Panjalu, Ciamis, West Java	1
10	Pangandaran Protected Area, Pangandaran, Ciamis, West Java	1
11	Petung Kriyono Reserved Forest and adjacent area, Pekalongan, Central Java	1
12	Rural area of Girimulyo, Kulon Progo, Yogyakarta	1
13	Nglanggeran, Patuk, Gunung Kidul, Yogyakarta	1
14	Mt. Ijen, East Java	1
15	Meru Betiri NP, Banyuwangi, East Java	1
16	Alas Purwo NP, Purwoharjo, Banyuwangi, East Java	1
T o t a l		36

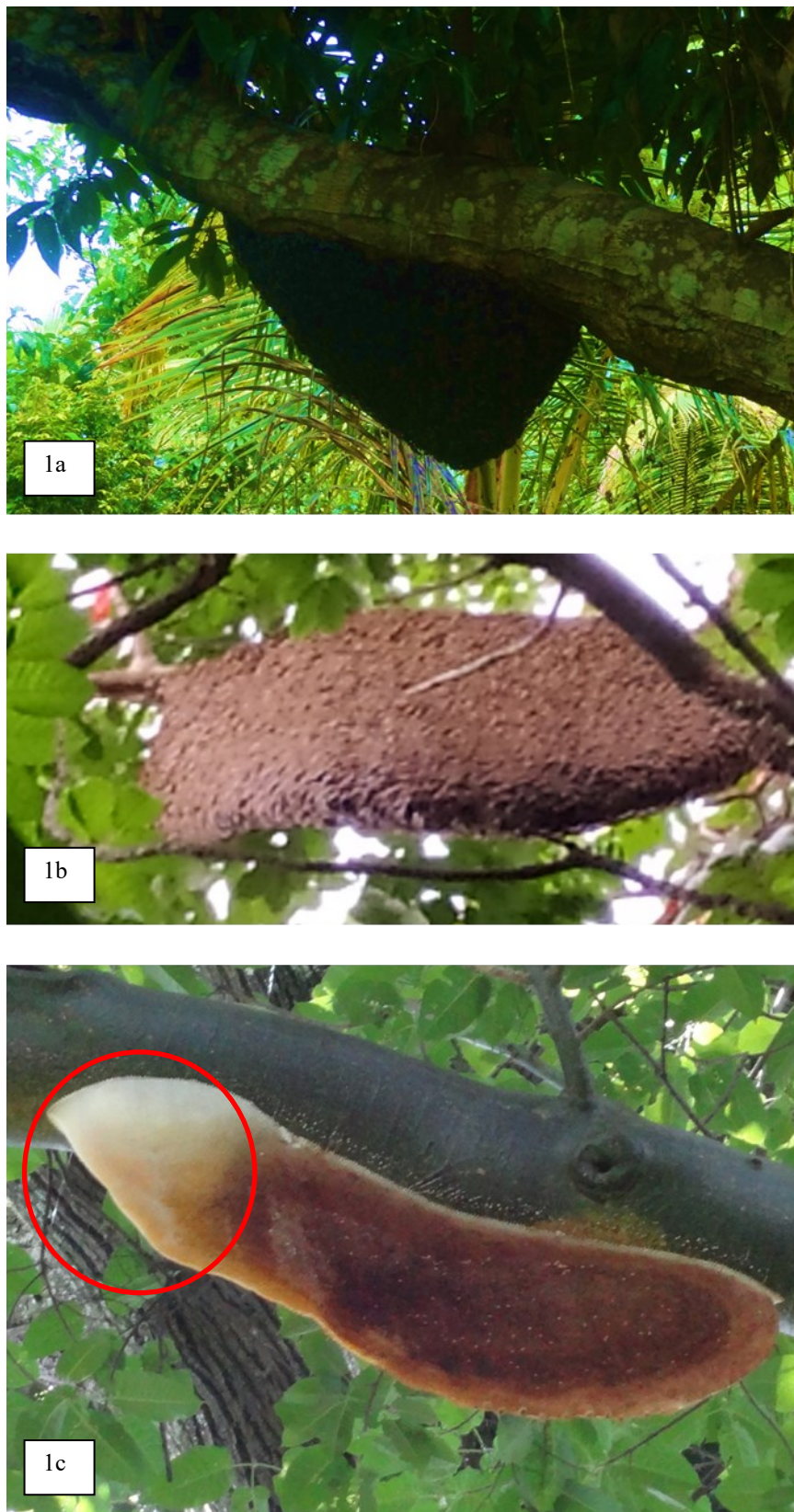
## RESULTS

### Hunting behavior of the Oriental Honey-buzzard

There are five categories of hunting behavior of the Oriental Honey-buzzard recorded during data collections: 1) flying orientation around the bee’s nest; 2) attack on the living nest; 3) failure to collect the living nest; 4) preying upon newly empty nest; and 5) transferring angry giant honeybee attack to people nearby (Table 2).

Hunting behavior of the Oriental Honey-buzzard began by searching the giant honeybee’s nest. The Oriental Honey-buzzard usually flew around as an orientation to look for the site of the bee comb. When the bee comb was found, the Oriental Honey-buzzard would fly closer to observe. If the bee’s nest was not yet developed, the Oriental Honey-buzzard never invaded it (Fig. 1a). The Oriental Honey-buzzard sometimes foraged in an active well-developed bee’s nest (Fig. 1b) and frequently foraged in the newly left empty nest of the giant honeybee (Fig. 1c).

Observations revealed that the Oriental Honey-buzzard attacked developed honeybee’s nest in straight flight, hitting the lower part of the nest. Huge numbers of the honeybees fought against the bird by attacking sensitive parts of the body of the eagle, such as the eyes.



**Figure 1.** A new coming colony of *A. d. dorsata* (a); a developed nest of *A. d. dorsata* (b); and red circle is a part of empty nest that the eagle like to eat (c).



While attacked by the angry honeybees, the eagle conducted a staggering fly while carrying a part of the comb away from the nesting site. After the nest of the honeybee was attacked by the eagle, for about five minutes, the honeybee was still angry and would attack humans or animals nearby. About hundreds of meters away from the nesting site, the eagle perched on the branch and enjoyed eating the comb.

Table 2 shows that the Oriental Honey-buzzard preferred to prey upon the empty nest left by the giant honeybee during emigration period than upon the living nest. This is because invading the empty nest was safer. The Oriental Honey-buzzard would not get attacked as the giant honeybee colonies have left. Before collecting an empty bee’s nest, the Oriental Honey-buzzard landed on a branch at a distance of about 10-12 meters from the bee’s nest before making an attack. Then it flew horizontally hitting the nest, clang to the nest for a moment, its claws gripped certain part of the nest, and finally flew with claws carrying the nest away. The Oriental Honey-buzzard would eat the nest on a branch not so far from the nest. Even though the Oriental Honey-buzzard eating the newly empty nest was no risk of being attacked by the bee, nonetheless the honey comb is less nutritious. A newly left empty comb contained used brood combs with a few numbers of undeveloped larvae, pupae, and bee pollen; and used honeycomb with the remaining honey. However the eagles selected only honeycomb (Figure 1b), a part of the nest containing only honey-smelling wax that can be eaten.

In contrast, an actively developed nest contained wealthy nutritious materials such as honey, bee pollen, and young stages of the bees. Such developed nests were guarded by a huge number of worker bees that are ready to fight against the Oriental Honey-buzzard as

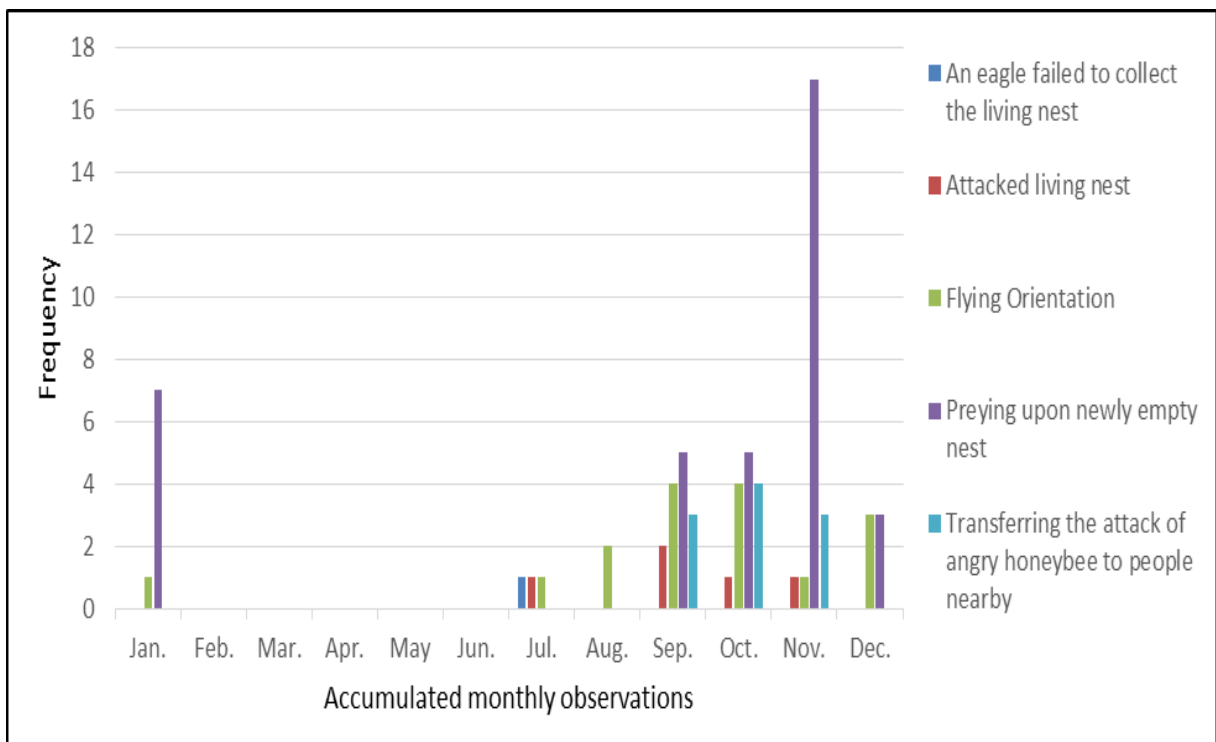
**Table 2.** Frequency of data collections on the behavior of the Oriental Honey-buzzard

No.	Recorded behavior	Source of data		Total
		Observation	Interview	
1	Flying orientation around the bee’s nest	4	11	15
2	Attack on the living nest	0	9	9
3	Failure to collect the living nest	0	1	1
4	Preying upon the newly empty nest	31	2	33
5	Transferring attack of the angry honeybee to people nearby	1	10	11
Total		36	32	69

their predator. When the eagle flew hovering near the bee's nest, although the nest had not been touched yet, the bees that detected its presence released pheromone, a strong aromatic smell of isopentyl acetate (Koeniger et al., 2010) which triggers panic and anger to the bees. Then, many angry bees would search and attack any moving objects near the nest, including animals and humans. In order to avoid those attacks, the experienced Oriental Honey-buzzard often transferred the attack by flying to the area where any people around as its strategy. In such conditions, someone who passes under the nest would become a target of attack by these angry bees. The bee's attack on the human who passed nearby the angry bee colony is the most common reason why the bees attacked people.

### The occurrence of human as victim of giant honeybee sting

In total, the study recorded 11 times data collections on the behavior of the Oriental Honey-buzzard transferred the attack of the angry giant honeybee to people nearby (Table 2). Most cases resulted in injured people being taken to a hospital. Two cases which occurred in Pelabuhan Ratu, Sukabumi in 2003 and Ciomas, Bogor in 2018 resulted in the death of the persons who suffered from the sting of giant honeybees.



**Figure 2.** Frequency of monthly data collection for each of the 5 categories in 2003-2019 (observations and interview)

### **Distribution on the occurrences of hunting behavior of the Oriental Honey-buzzard during migratory period**

The migratory giant honeybee usually arrives on Java island in either June or July, and the migratory Oriental Honey-buzzard comes after that (Kahono et al., unpublished data). The giant honeybee usually nests in the same location every migratory season.

Figure 2 shows that the hunting behavior of the Oriental Honey-buzzard indicated by flying orientation to look for the giant honeybee nest occurred from July to January; failure to collect the living nest occurred in July; attacked the living nest occurred in July, September, October, and November. Preying upon the newly empty nest of giant honeybee occurred from September to January, with the peak in November. Transferring the attack of angry giant honeybee to people nearby occurred in September, October and November with the peak in October.

### **DISCUSSION**

The Oriental Honey-buzzard was usually successful in attacking the honey bee comb. Once evidence of an eagle failed to take the honeybee comb and fell down to the ground after being attacked by huge numbers of the angry bees. There has been no published report on this. Presumably, the eagle was a young individual and had a lack of hunting experience.

The frequency of behavior of the Oriental Honey-buzzard preying upon the empty nest of the Giant Honey-bee starts to increase in September, October, November, December until January with the highest peak in November. This pattern is followed by the number of arrival of migratory Oriental Honey-buzzards on Java island. They usually arrive in large numbers in September, more in October and some more in November. They usually stay until February (Higuchi, 2016), and then they fly back to Siberia or Japan.

The study indicates that the migratory Oriental Honey-buzzard is the main natural enemy of migratory giant honeybees in its wintering area. The Oriental Honey-buzzard feeds on brood, honey, pollen, and even adult bees (Koeniger et al., 2010). Unlike the Western Honey-buzzard (*Pernis apivorus*) which attacks the invasive Asian hornet *Vespa velutina* (Macià et al., 2019), the migratory Oriental Honey-buzzard was never observed to attack any *Vespa* spp. nests, although it is also recorded on Java island. *Vespa* wasps are a group of stingers that have the largest body and strongest stinging power than any other stinging insects, which are currently the center of attention because recently they are often found stinging human beings (Kahono, in preparation). It is not true that the giant honeybee is aggressive in attacking people for no reason. The giant honeybee will be angry when their nest is disturbed by predators and annoying activity. The bee is among the most dangerous

animals since its threatening defensive behavior causes a severe impact. The bee has a powerful sting (Ratnayake et al., 2018) that remains in the skin and pumps the poison that is used for defense against destructors and predators (Snodgrass, 1910).

Local people believe that the Oriental Honey-buzzard is a clever predator by reducing the risk of being attacked by angry bees by flying near human to transfer the attack of many angry bees. A decline in the available natural habitat of the bee has caused an increasing frequency of the bee nesting in the urban areas. Thus, as a result, the frequency of human encounters with angry bees have increased in the suburb or urban areas.

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