ISSN : 0082 - 6340
E-ISSN : 2337 - 876X
Accredited : 30/E/KPT/2018

LIPI

TREUBIA

A JOURNAL ON ZOOLOGY
OF THE INDO-AUSTRALIAN ARCHIPELAGO

Vol. 46, pp. 1–113 **December 2019**

Published by

RESEARCH CENTER FOR BIOLOGY
INDONESIAN INSTITUTE OF SCIENCES
BOGOR, INDONESIA

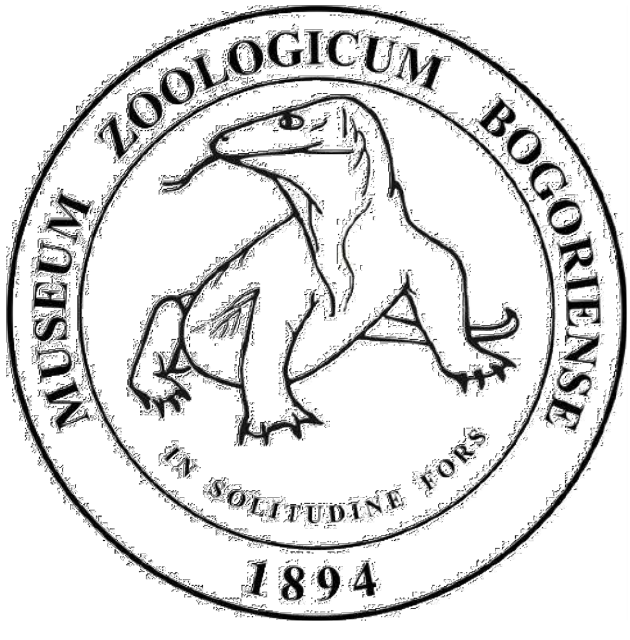
ISSN : 0082 - 6340
E-ISSN : 2337 - 876X
Accredited : 30/E/KPT/2018

LIPI

TREUBIA

A JOURNAL ON ZOOLOGY
OF THE INDO-AUSTRALIAN ARCHIPELAGO

Vol. 46, pp. 1–113 **December 2019**



Published by

RESEARCH CENTER FOR BIOLOGY
INDONESIAN INSTITUTE OF SCIENCES
BOGOR, INDONESIA

ISSN : 0082 - 6340
E-ISSN : 2337 - 876X
Accredited : 30/E/KPT/2018

TREUBIA

A JOURNAL ON ZOOLOGY OF THE INDO-AUSTRALIAN ARCHIPELAGO
Vol. 46, pp. 1–113, December 2019

Board of Editors:
Dr. Djunijanti Peggie, M.Sc. (Chief Editor)
Dr. Dewi Malia Prawiradilaga, M.Rur.Sc.
Dr. Daisy Wowor, M.Sc.
Dr. Kartika Dewi
Dr. Dhian Dwibadra
Dr. Conni Margaretha Sidabalok, M.App.Sc.

International Editors:

Dr. Paul Bates, M.A.	Harrison Institute Bowerwood House 15 Botolph's Road Sevenoaks, Kent, TN13 3AQ, UK
Dr. Thomas von Rintelen	Museum für Naturkunde Leibniz - Institut für Evolutions und Biodiversitat sforschung an der Humboldt-University zu Berlin, Invaliden straβe 43, 10115 Berlin, Germany
Dr. Alan T. Hitch	University of California, Davis, CA 95616, USA

Referees:

Dr. Chris Reid	Entomology, University New South Wales, Australian Museum, 1 William Street, Sydney, NSW 2010, Australia
Dr. Michael Balke	Zoologische Staatssammlung München, Münchhausenstraße 21, München, 81247 Germany
Dr. Chris J Müller	Australian Museum, 6 College Street, Sydney, NSW 2010, Australia
Dr. Chooi Khim Phon	Tropical Forest Biodiversity Centre, Forest Research Institute Malaysia (FRIM), Kepong, Selangor; Zoological and Ecological Research Network, Institute of Biological Sciences, Faculty of Science, University of Malaya, Kuala Lumpur, Malaysia
Prof. Dr. Masahiro Ôhara	The Hokkaido University Museum, Japan
Dr. Peter Allsopp	Queensland Museum, South Brisbane, Queensland, Australia
Dr. Aleš Bezděk	Biology Centre of the Czech Academy of Sciences, Institute of Entomology, Czech Republic
Dr. Mirza D. Kusrini	Bogor Agricultural University, IPB-Department of Forest Resources Conservation and Ecotourism, Bogor, Indonesia
Prof. Dr. Susumu Ohtsuka	Graduate School of Integrated Sciences for Life, Setouchi Field Science Center, Hiroshima University, Japan
Dr. J. C. von Vaupel Klein	Rembrandtlaan 57, Bilthoven, Netherlands
Dr. R.I. Vane-Wright	Durrell Institute of Conservation and Ecology, School of Anthropology and Conservation, University of Kent, Canterbury, CT2 7NR, UK; Life Sciences, Natural History Museum, Cromwell Road, London SW7 5BD, UK
Dr. Sih Kahono	Zoology Division, Research Center for Biology, Indonesian Institute of Sciences (LIPI), Indonesia
Eko Sulistyadi, M.Si.	Zoology Division, Research Center for Biology, Indonesian Institute of Sciences (LIPI), Indonesia
Maharadatunkamsi, M.Sc.	Zoology Division, Research Center for Biology, Indonesian Institute of Sciences (LIPI), Indonesia
Prof. Dr. Paul A. Racey	Queensland Museum, South Brisbane, Queensland, Australia

Managing Assistant:
Sri Wulan, S. Ikom.

Layout:
Liana Astuti

Distribution:
Rustan Nawawi

Subscription and Exchange

TREUBIA
RESEARCH CENTER FOR BIOLOGY - INDONESIAN INSTITUTE OF SCIENCES (LIPI)
Jl. Raya Jakarta-Bogor Km. 46, Cibinong-Bogor 16911, Indonesia
e-mail: treubia@gmail.com
http://e-journal.biologi.lipi.go.id/index.php/treubia

VOL. 46, DECEMBER 2019

CONTENT

TREUBIA

(A JOURNAL ON ZOOLOGY OF THE INDO-AUSTRALIAN ARCHIPELAGO)

ISSN : 0082 - 6340
E-ISSN : 2337 - 876X

Date of issue: DECEMBER 2019

This abstract sheet may be reproduced without permission or charge

UDC: 595.76(594.53)

Yaheita Yokoi

Callidiopini beetles (Coleoptera: Cerambycidae) in the collection of Museum Zoologicum Bogoriense, Indonesia

TREUBIA, December 2019, Vol. 46, pp. 1–20.

Callidiopini species in the collection of Museum Zoologicum Bogoriense, Indonesian Institute of Sciences (LIPI) were examined. Three new species of the genus *Ceresium* Newman, 1842, are described, i.e. *C. clytinioides* sp. nov., *C. sugiartoi* sp. nov., both from Kalimantan, and *C. emarginatum* sp. nov. from Papua. One new species of the genus *Examnes* Pascoe, 1869, from Kalimantan, *E. subvermiculatus* sp. nov. is described.

(Yaheita Yokoi, Hiroshi Makihara and Woro A. Noerdjito)

Keywords: Asia, Kalimantan, longhorn beetle, New Guinea, taxonomy

UDC: 595.78.001.03(594.81)

R.I. Vane-Wright

The identity of *Euploea tulliolus goodenoughi* Carpenter, 1942, a crow butterfly (Lepidoptera: Nymphalidae, Danainae) from Papua New Guinea

TREUBIA, December 2019, Vol. 46, pp. 21–34.

The nominal taxon *Euploea tulliolus goodenoughi* Carpenter, 1942, based on a unique crow butterfly collected on Goodenough Island in 1913, is shown to represent a small, aberrant female of the locally common *Euploea leucostictos eustachius* (Kirby, 1889). This new synonymy invalidates the only previous record of the Purple Crow, *Euploea tulliolus* (Fabricius, 1793), from the islands of Milne Bay Province, Papua New Guinea. However, two female *Euploea tulliolus* collected from islands in the Louisiade Archipelago during 2010 are reported here, constituting the first valid records of the Purple Crow from the Milne Bay islands.

(R.I. Vane-Wright)

Keywords: *tulliolus* species complex, new synonymy, new records, Milne Bay islands, *Euploea leucostictos*

UDC: 595.762(594.31)

Raden Pramesa Narakusumo

Four new species of *Epholcis* Waterhouse (Coleoptera: Scarabaeidae: Melolonthinae: Maechidiini) from the Moluccas, Indonesia

TREUBIA, December 2019, Vol. 46, pp. 35–50.

Here, we provide the first record of the chafer beetle genus *Epholcis* Waterhouse, 1875 from the Moluccas, Indonesia. We describe four new species: *E. acutus* sp. nov., *E. arcuatus* sp. nov., *E. cakalele* sp. nov., and *E. obiensis* sp. nov. A lectotype is designated for *Maechidius moluccanus* Moser, 1920, which is redescribed and transferred to the genus *Epholcis* as *E. moluccanus* (Moser) comb. nov.

(Raden Pramesa Narakusumo and Michael Balke)

Keywords: Coleoptera, *Epholcis*, Maechidiini, Melolonthinae, Moluccas

UDC: 597.82(594.17)

Mediyansyah

A new tree frog of the genus *Kurixalus* Ye, Fei & Dubois, 1999 (Amphibia: Rhacophoridae) from West Kalimantan, Indonesia

TREUBIA, December 2019, Vol. 46, pp. 51–72.

Kurixalus absconditus sp. nov., a new species of tree frog of the genus *Kurixalus,* described from West Kalimantan on the basis of molecular phylogenetic and morphological evidence. The new species can be distinguished from its congeners by a combination of following morphological characters: having smaller body size, more prominent of mandibular symphysis, skin smooth on throat, vomerine odontophores two oblique series touching anterior corner of choanae and widely separated, vomerine teeth thick, buccal cavity narrow and deep, choanae with teardrop shaped, single vocal slit, weakly crenulated dermal fringe on fore- and hindlimbs.

(Mediyansyah, Amir Hamidy, Misbahul Munir and Masafumi Matsui)

Keywords: *Kurixalus absconditus* sp. nov., new species, West Kalimantan

UDC: 594.34.001.03(594.11)

Mulyadi

New records and redescription of *Labidocera rotunda* Mori, 1929 (Copepoda, Calanoida, Pontellidae) from Sebatik Island, North Kalimantan, Indonesia, with notes on its species-group

TREUBIA, December 2019, Vol. 46, pp. 73–84.

During a plankton trip around Sebatik Island, North Kalimantan, a copepod *Labidocera rotunda* Mori, 1929 (Calanoida, Pontellidae) was collected for the first time in Indonesian waters. Both sexes are redescribed and compared to previous descriptions. The geographical distribution of the species confirms that it is of Indo-Pacific origin. There has been a mix-up between *L. rotunda* described by Mori (1929) from Pusan, Korea and *L. bipinnata* from Sagami Bay, described by Tanaka (1936). Fleminger et al. (1982) have argued that the minor difference is based on the presence or absence of cephalic hooks and had synonymized *L. bipinnata* with *L. rotunda*.

(Mulyadi)

Keywords: copepods, Indonesia, *Labidocera rotunda*, new record, Pontellidae

UDC: 595.78:57.01(594.53)

Djunijanti Peggie

Biological aspects of *Papilio peranthus* (Lepidoptera: Papilionidae) as observed at Butterfly Research Facility - LIPI, Cibinong, Indonesia

TREUBIA, December 2019, Vol. 46, pp. 85–102.

Papilio peranthus is endemic to Indonesia, where it occurs on several islands and island groups. This beautiful butterfly is extensively traded, thus efforts to breed this species are very desirable. Captive breeding research was conducted on *P. peranthus* during September 2016 to December 2018. In total, 221 individuals were available for observation. Data on the life cycle of the species, together with observations on females being approached for mating, and female oviposition after mating, are presented. The result demonstrate that *P. peranthus* is not monogamous. Observations on other biological aspects are also reported.

(Djunijanti Peggie)

Keywords: egg-laying, mating, life cycle, *Papilio peranthus*, parent stocks

UDC: 599.41:001.891(594)

Susan M. Tsang

Review - Indonesian flying foxes: research and conservation status update

TREUBIA, December 2019, Vol. 46, pp. 103–113.

Flying foxes are important ecological keystone species on many archipelagoes, and Indonesia is home to over a third of all flying fox species globally. However, the amount of research on this clade belies their importance to natural systems, particularly as they are increasingly threatened by anthropogenic development and hunting. Here, we provide a review of the literature since the publication of the Old World Fruit Bat Action Plan and categorize research priorities as high, medium, or low based on the number of studies conducted. A majority of the research priorities for Indonesian endemics are categorized as medium or high priority. Low priority ratings were in multiple categories for widespread flying fox species found throughout Southeast Asia, though much of the data were from outside of the Indonesian extent of the species range. These research gaps tend to highlight broader patterns of research biases towards western Indonesia, whereas significant research effort is still needed in eastern Indonesia, particularly for vulnerable island taxa.

(Susan M. Tsang and Sigit Wiantoro)

Keywords: bats, conservation, Pteropodidae, *Pteropus*, threats

Treubia 46: 103–113, December 2019

DOI: 10.14203/treubia.v46i0.3792

REVIEW

INDONESIAN FLYING FOXES: RESEARCH AND CONSERVATION STATUS UPDATE

Susan M. Tsang[1,2]* and Sigit Wiantoro[3]

[1] Department of Mammalogy, Division of Vertebrate Zoology, American Museum of Natural History, New York, New York, USA
[2] Mammalogy Section, National Museum of Natural History of the Philippines, Manila, Philippines
[3] Zoology Division (Museum Zoologicum Bogoriense), Research Center for Biology, Indonesian Institute of Sciences, Jl. Raya Jakarta–Bogor Km. 46, Cibinong, Bogor 16911, Indonesia
*Corresponding author: stsang@amnh.org

Received: 15 May 2019; Accepted: 25 November 2019

ABSTRACT

Flying foxes are important ecological keystone species on many archipelagoes, and Indonesia is home to over a third of all flying fox species globally. However, the amount of research on this clade belies their importance to natural systems, particularly as they are increasingly threatened by anthropogenic development and hunting. Here, we provide a review of the literature since the publication of the Old World Fruit Bat Action Plan and categorize research priorities as high, medium, or low based on the number of studies conducted. A majority of the research priorities for Indonesian endemics are categorized as medium or high priority. Low priority ratings were in multiple categories for widespread flying fox species found throughout Southeast Asia, though much of the data were from outside of the Indonesian extent of the species range. These research gaps tend to highlight broader patterns of research biases towards western Indonesia, whereas significant research effort is still needed in eastern Indonesia, particularly for vulnerable island taxa.

Keywords: bats, conservation, Pteropodidae, *Pteropus*, threats

ABSTRAK

Kalong merupakan spesies kunci yang memiliki peran penting bagi ekosistem, dan lebih dari sepertiga jumlah spesies yang ada di dunia, ditemukan di Indonesia. Namun, jumlah penelitian tentang spesies kalong tidak mencerminkan akan nilai penting kalong bagi ekosistem dan semakin meningkatnya ancaman akibat aktivitas manusia dan perburuan. Studi ini menyajikan tinjauan literatur yang diterbitkan setelah munculnya publikasi Rencana Aksi Pengelolaan Kelelawar Pemakan Buah (*Old World Fruit Bat Action Plan*) dan menentukan prioritas penelitian yang meliputi kategori tinggi, sedang dan rendah berdasarkan jumlah studi yang telah dilakukan. Sebagian besar prioritas penelitian untuk spesies endemik Indonesia termasuk di dalam kategori sedang atau tinggi. Penelitian yang dikategorikan sebagai prioritas rendah adalah untuk penelitian spesies kalong yang memiliki daerah distribusi sangat luas meliputi Kawasan Asia Tenggara, meskipun sebagian besar data yang digunakan tidak berasal dari daerah distribusi kalong di Indonesia. Kesenjangan penelitian saat ini dikarenakan adanya kecenderungan untuk melakukan penelitian di kawasan bagian barat Indonesia, padahal upaya untuk melakukan penelitian di kawasan timur Indonesia masih sangat diperlukan, terutama kelompok taksa yang rentan terhadap ancaman dan memiliki sebaran terbatas di pulau tertentu.

Kata kunci: kalong, konservasi, Pteropodidae, *Pteropus*, ancaman

Indonesia is home to over a third of all flying foxes (*sensu stricto* genus *Pteropus* and *Acerodon*, Simmons, 2005); however, research on them is limited relative to other vertebrate taxa, especially mammals, making it difficult to monitor species and create conservation management plans. Yet, they constitute some of the most ecologically important and threatened species on the IUCN Red List and have a plethora of potential threats that cannot

be dealt with due to lack of information (Mickleburgh et al., 2002; IUCN, 2016). Six flying fox species have gone extinct in recent history, all of which have been island endemics (Simmons, 2005; Helgen et al., 2009). This highlights the need to study Indonesian flying foxes to prevent their extinction, as many of the Indonesian species are also island endemics. Additionally, they fulfill important ecological roles as seed dispersers and pollinators (Fujita & Tuttle, 1991; Sheherazade et al., 2019), along with as natural reservoir hosts for zoonotic pathogens (Wang, et al., 2008), meaning decline of a species could lead to negative impacts in other parts of the natural ecosystem. However, there is a tendency to focus on the most visible species, and a guide to what has been completed already would help identify where research priorities are. Other barriers to research, such as lack of access to literature for scientists in developing countries, make it difficult to create novel projects that address core issues or data gaps relevant to conservation priorities (Tsang et al., 2016).

This study aims to review and recommend directions for research on flying foxes in Indonesia to better guide in-country conservation efforts for aspiring researchers and practitioners, along with data needed for listing species. This study is also important to the revision of the Old World Fruit Bat Action Plan, which is currently underway, in reflecting on what some of the world's most threatened fruit bats need on a fundamental level in research before conservation or management action is even possible. We specifically chose to focus on Indonesian flying fox species only, as their level of diversity (23 species) is significantly higher than in any other country (*e.g.* second highest number of flying foxes are found on Papua New Guinea, which has less than half the Indonesian species total).

For Indonesian flying foxes, we included *Pteropus* (20 species) and *Acerodon* (3 species), and also added in two closely related pteropodids in tribe Pteropodini, *Neopteryx frosti* and *Styloctenium wallacei*. Searches were conducted in the following databases: Scopus, Web of Science, Google Scholar, ResearchGate, and gray literature (such as grant or NGO reports, or student theses). The reviewed literature prioritized studies with newly generated data and focus on information that usually goes into an IUCN Red List threat assessment: taxonomy, population data, habitat preferences/roosting ecology, diet, threats, and conservation actions, including whether the species is in a protected area. We also included notes based on our own fieldwork and collections-based research at the Museum Zoologicum Bogoriense, American Museum of Natural History, National Museum of Natural History at the Smithsonian Institution, Field Museum of Natural History, and National Museum of Natural History of the Philippines. Taxonomy and subspecies distributions follow Simmons (2005), with more recent literature noted in each species account if relevant.

Prioritization. We used the previous Old World Fruit Bat Action Plan (Mickleburgh et al., 1992) as the baseline for this study, and anything published after 1992 and not cited by the

Action Plan are considered "new literature" in this study. We omitted: 1) studies related to pathogen discovery, as these data are not considered when assessing the IUCN Red List status; 2) studies that use a *Pteropus* or *Acerodon* species as a representative of larger clades, as those studies usually are not attempting to resolve long-standing taxonomic issues for those specific taxa; and 3) review papers that are citing past papers but do not add further understanding to the species. Inclusion of these papers would overinflate the amount of prior research recorded. Whether knowledge gaps were addressed or not was rated based on whether any literature with new data were generated: high priority (0 studies), medium priority (1-2 studies), low priority (3+ studies). If there was discussion in the text of species-specific issues, those papers were included. Review papers were only included if the original source could not be accessed. For widespread taxa, we include information on the species from other countries in its range. This is necessary since flying foxes can be transboundary, though we indicate whether those data are missing from the Indonesian part of its distribution.

In total, we reviewed 86 papers, reports or status assessments. We summarized species priorities in Table 1, with specific citations in Appendix 1. Almost all of the categories for Indonesian endemics were of high or medium priority. A majority of the high priority ratings belonged to species on very remote and isolated islands, or species that do not form large aggregate colonies at day roosts. These results reflect issues in accessibility to field sites and difficulties in tracking solitary animals in complex landscapes.

A majority (2 of 17) of the 'low priority' ratings were of widespread species that are also found in other countries. These studies can be informative for Indonesian species, but that is highly dependent on the species. For instance, *P. vampyrus sumatrensis* is well-studied in peninsular Malaysia, and that particular population crosses into Sumatra often (Epstein et al., 2009) and is the same subspecies as that of the rest of Sumatra (Tsang et al., 2018), making the findings relevant to species management planning throughout the island. However, with *P. alecto alecto* in Sulawesi compared to *P. alecto gouldi* in Australia, there are different human-animal interfaces, different habitats in the landscape, and fewer sympatric flying fox species, making the contributions from only a single subspecies to the IUCN Red List assessment inapplicable to the species across its range.

Remarks. Many of the priorities and recommended actions listed in Mickleburgh (1992) have not been addressed, and those still stand as large knowledge gaps. The relative lack of Indonesia-specific data does not allow for more localized conservation planning. Additionally, though some of the taxonomic studies are listed as medium priority, many of them only found enough evidence to suggest the species needs further review, but has yet to fully resolve the issue. We also caution the incorrect interpretation of "low priority" to mean that no research is needed in that area. If a species is highly threatened, that may have been

the original thrust for conducting more research on the species, and each individual species level of threat must also be taken into account to some degree when selecting priorities.

These difficulties in accessibility and tracking of flying foxes mirror knowledge gaps of Indonesian biodiversity in general, especially in eastern Indonesia. This is an important distinction, as there are more flying fox species eastward where there are both more islands and fewer native terrestrial mammals to fill in ecological roles (Corbet & Hill, 1992). Published research is heavily biased towards Sundaland, especially Kalimantan (Giam & Wilcove, 2012), and that needs to change if the goal is to reduce extinction risk to threatened endemic island taxa.

Not all studies require high-tech tools, but most require that time is spent understanding a local landscape and then tracking and observing the flying foxes. An example from another low-resource country would be from recent studies on monitoring and diet of flying foxes from Myanmar (Win & Mya, 2015; Oo et al., 2017). These studies relied on observations over an extended period of time, and in some instances were able to reveal important information about the species natural history and potential threats. A second example are reproductive ecology studies of bats from Malaysia (Nurul-Ain et al., 2017) and Vietnam (Furey et al., 2012), which can contribute to the breeding information known about a species. These above types of data are important to the IUCN and other practitioners, as they bridge knowledge gaps that hinder the creation of actionable items, such as formation of a species or habitat management plan.

With the right amount of support and targeted research, Indonesia could make big gains in all areas of research, including on bats, in the years to come. Given the wide breadth of types of research needed for flying foxes, students could potentially learn a variety of skills that are useful for multiple types of careers after they have completed their studies. This requires that budding scientists are encouraged to pursue natural history and are given the tools and guidance needed to determine where their efforts could potentially have the most impact. Flying foxes are especially relevant to discussions related to sustainability, forestry, agriculture, fisheries and tourism, as these bats affect habitats that are critical to all of these sectors, and studies aimed at addressing knowledge gaps have the potential for making a significant impact for both bats and society. Furthermore, a fuller understanding of the natural history of flying foxes could be strategically utilized in education and outreach campaigns to target socially relevant pressure points for promoting flying fox conservation. Since many of the threats that face flying foxes are human-induced (*e.g.* hunting of *Pteropus alecto* and *Acerodon celebensis* from Sheherazade & Tsang 2015, or habitat conversion for Moluccan *Pteropus* from Tsang et al., 2015), engagement with the public is essential to species persistence, and that cannot be done well unless educational and developmental activities are couched in good science.

Table 1. Summary of research priorities by species. High priority (0 studies) is shaded in black, medium priority (1 to 2 studies) is shaded in gray, and low priority is unshaded. An additional asterisk (*) indicates which category had a majority of studies from other parts of the species distribution outside of Indonesia. Numbers represent number of studies that contains data on the relevant subject, with fields intentionally left blank if there were no studies at all. The full list of citations is sorted by species in Appendix 1.

Species	Taxonomy	Habitat	Threats	Diet	Reproduction	Conservation
Pteropus alecto	5*	6*	2	5*	3*	5*
Pteropus aruensis						1
Pteropus caniceps	1	1	1	1	1	
Pteropus chrysoproctus	1	1	1			1
Pteropus conspicillatus	7*	3*	1*	1*	2*	2*
Pteropus griseus	3	1	3			1
Pteropus hypomelanus	3*	3*	3*	4*	1*	2
Pteropus keyensis	1					
Pteropus lombocensis	4	1	1	1		1
Pteropus macrotis	1	1		1	1	
Pteropus melanopogon	1	1	1	1		1
Pteropus melanotus	1*	1*	1*		1*	2*
Pteropus neohibernicus	2*	1*	2	2*	1*	
Pteropus ocularis	1	1				1
Pteropus personatus	3	2				
Pteropus pohlei	1	1		1	1	
Pteropus pumilus	3*	5*	2*			2*
Pteropus speciosus	2					
Pteropus temminckii	1	2	1			1
Pteropus vampyrus	4	7*	10*	2*	1*	5*
Acerodon celebensis	3		5	3	1	2
Acerodon humilis	1		2			
Acerodon mackloti	1					
Neopteryx frosti	1		1			
Styloctenium wallacei	1					1

ACKNOWLEDGMENTS

We thank the Ministry of Research and Technology (RISTEK) and the Ministry of the Environment and Forestry of the Republic of Indonesia for their support of this project. This review was part of a larger body of research funded by the Fulbright Indonesia Student Research Fellowship and the National Geographic Society Young Explorers Grant (9272-13) awarded to S.M. Tsang and in part by the National Institute of Allergy and Infectious Diseases under Grant No. 1R21A|105050 to D.J. Lohman and N.B. Simmons.

REFERENCES

Alcazar, S.M.T., Agbay, E.A., Lillo, E.P., Malaki, A.B., Alburo, H.M., Rosalyn, P.O., Obiso, L.S., Hoyohoy, G.B., Luz, R., Rebecca, V.R. & Rosalyn, P.O. 2008. Fruit bats diversity in the three sites in Argao Watershed, southern Cebu, Philippines. *Tropical Technology Journal,* 11: 1–8.

Almeida, F. C., Giannini, N.P., Simmons, N.B. & Helgen, K.M. 2014. Each flying fox on its own branch: A phylogenetic tree for *Pteropus* and related genera (Chiroptera: Pteropodidae). *Molecular Phylogenetics and Evolution*, 77: 83–95.

Aul, B., Bates, P.J.J., Harrison, D.L. & Marimuthu, G. 2014. Diversity, distribution and status of bats on the Andaman and Nicobar Islands, India. *Oryx*, 48: 204–212.

Aziz, S.A., Clements, G.R., Giam, X., Forget, P.-M. & Campos-Arceiz, A. 2017a. Coexistence and conflict between the island flying fox (*Pteropus hypomelanus*) and humans on Tioman Island, Peninsular Malaysia. *Human Ecology*, 45: 377–389.

Aziz, S.A., Clements, G.R., Peng, L.Y., Campos-Arceiz, A., McConkey, K.R., Forget, P.-M. & Gan, H.M. 2017b. Elucidating the diet of the island flying fox (*Pteropus hypomelanus*) in Peninsular Malaysia through Illumina next-generation sequencing. *PeerJ,* 5: e3176.

Aziz, S.A., Clements, G.R., McConkey, K.R., Sritongchuay, T., Pathil, S., Abu Yazid, M.N.H., Campos-Arceiz, A., Forget, P.-M. & Bumrungsri, S. 2017c. Pollination by the locally endangered island flying fox (*Pteropus hypomelanus*) enhances fruit production of the economically important durian (*Durio zibethinus*). *Ecology and Evolution,* 7: 8670–8684.

Bastian Jr., S.T., Tanaka, K., Anunciado, R.V.P., Natural, N.G., Sumalde, A.C. & Namikawa, T. 2002. Evolutionary relationships of flying foxes (genus *Pteropus*) in the Philippines inferred from DNA sequences of cytochrome b gene. *Biochemical Genetics,* 40: 101–116.

Bennett, N.J. & Roth, R. 2015. *The Conservation Social Sciences: What?, How? And Why?* Vancouver, BC: 85 pp.

Bonaccorso, F.J. 1998. *Bats of Papua New Guinea.* Washington, D.C.: Conservation International: 487 pp.

Breed, A.C., Field, H.E., Smith, C.S., Edmonston, J. & Meers, J. 2010. Bats without borders: Long-distance movements and implications for disease risk management. *EcoHealth,* 7: 204–212.

Cayunda, I.E.B., Ibanez, J.C. & Bastian Jr., S.T. 2004. Roosting behavior and roost site characterization of *Pteropus vampyrus* in Malagos Watershed, Davao City. *Agham Mindanaw* 2: 61–72.

Chng, S.C.L., Guciano, M. & Eaton, J.A. 2016. In the market for extinction: Sukahaji, Bandung, Java, Indonesia. *BirdingASIA,* 26: 22–28.

Chng, S.C.L., Eaton, J.A. , Krishnasamy, K. & Shepherd, C.R. 2015. *In the Market for Extinction: An Inventory of Jakarta's Bird Markets*. Selangor, Malaysia: Petaling Jaya: 31 pp.

Clements, G.R. 2013. *The Environmental and Social Impacts of Roads in Southeast Asia*. Ph.D Thesis, James Cook University, 266 pp.

Colgan, D.J. & da Costa, P. 2002. Megachiropteran evolution studied with 12S rDNA and c-mos DNA sequences. *Journal of Mammalian Evolution,* 9: 3–22.

Corbet, G.B. & Hill, J.E. 1992. *The Mammals of the Indo-Malayan Region*. Oxford: Oxford University Press: 488 pp.

Croes, J.J. 2012. *Closing Shop? An Analysis of Cultural, Spatial and Temporal Trends of Indonesian Wildlife Markets through Traders' Eyes*. M.S. Thesis, Imperial College London, 77 pp.

Deligero, J. 2018. Forest bat diversity in different habitats on Mt. Kanlaon Natural Park, Negros Island. *Proceedings of the 25th Biodiversity Conservation Society of the Philippines*, 23 pp.

Epstein, J.H., Olival, K.J. , Pulliam, J.R.C., Smith, C.S., Westrum, J., Hughes, T., Dobson, A.P., Zubaid, A., Rahman, S.A., Basir, M.M., Field, H.E. & Daszak, P. 2009. *Pteropus vampyrus*, a hunted migratory species with a multinational home-range and a need for regional management. *Journal of Applied Ecology,* 46: 991–1002.

Esselstyn, J.A. 2007. A new species of stripe-faced fruit bat (Chiroptera: Pteropodidae: *Styloctenium*) from the Philippines. *Journal of Mammalogy,* 88: 951–958.

Esselstyn, J.A., Widmann, P. & Heaney, L. R. 2004. The mammals of Palawan Island, Philippines. *Proceedings of the Biological Society of Washington,* 117: 271–302.

Fatem, S., Peday, M.H. & Yowei, R.N. 2014. Ethno-biological notes on the Meyah Tribe from the northern part of Manokwari, West Papua. *Jurnal Manusia Dan Lingkungan,* 21: 121–127.

Flakus, S., Pahor, S., Detto, T. & Maple, D. 2014. *Status Report - September 2014: Monitoring, Research and Management of the Christmas Island Flying-Fox (*Pteropus melanotus natalis*)*. 35 pp.

Flannery, T.F. 1995. *Mammals of the South-West Pacific and the Moluccan Islands*. Ithaca, New York: Cornell University Press: 464 pp.

Fox, S. 2006. *Population Structure in the Spectacled Flying Fox, Pteropus conspicillatus: A Study of Genetic and Demographic Factors.* Ph.D Thesis, James Cook University, 181 pp.

Fox, S., Waycott, M., Blair, D. & Luly, J. 2012. Regional genetic differentiation in the spectacled flying fox (*Pteropus conspicillatus* Gould). In: S.G. Haberle & B. David, eds. *Peopled Landscapes: Archaeological and Biogeographic Approaches to Landscapes*. Canberra: ANU E Press: pp. 459–472.

Fox, S., Luly, J., Mitchell, C., Maclean, J. & Westcott, D.A. 2008. Demographic indications of decline in the spectacled flying fox (*Pteropus conspicillatus*) on the Atherton Tablelands of northern Queensland. *Wildlife Research,* 35: 417–424.

Fujita, M.S. & Tuttle, M.D. 1991. Flying foxes (Chiroptera: Pteropodidae): Threatened animals of key ecological and economic importance. *Conservation Biology,* 5: 455–463.

Furey, N.M., Mackie, I.J. & Racey, P.A. 2012. Reproductive phenology of bat assemblages in Vietnamese karst and its conservation implications. *Acta Chiropterologica,* 13: 341–354.

Giam, X. & Wilcove, D.S. 2012. The geography of conservation ecology research in Southeast Asia: Current biases and future opportunities. *The Raffles Bulletin of Zoology,* Supplementary 5: 29–36.

Goodwin, R.E. 1979. The bats of Timor: Systematics and ecology. *Bulletin of the American Museum of Natural History,* 163: 77–122.

Gumal, M.T. 2004. Diurnal home range and roosting trees of a maternity colony of *Pteropus vampyrus natunae* (Chiroptera: Pteropodidae) in Sedilu, Sarawak. *Journal of Tropical Ecology,* 20: 247–258.

Harrison, M.E., Cheyne, S.M., Darma, F., Angan, D., Limin, S.H. & Struebig, M.J. 2011. Hunting of flying foxes and perception of disease risk in Indonesian Borneo. *Biological Conservation,* 144: 2441–2449.

Helgen, K.M. 2004. On the identity of flying-foxes, genus *Pteropus* (Mammalia: Chiroptera), from islands in the Torres Strait, Australia. *Zootaxa*, 780: 1–14.

Helgen, K.M. & Bonaccorso, F. 2013. *Pteropus temminckii*. in *IUCN Red List of Threatened Species*.

Helgen, K.M., Helgen, L.E. & Wilson, D.E. 2009. Pacific flying foxes (Mammalia: Chiroptera): Two new species of *Pteropus* from Samoa, probably extinct. *American Museum Novitates,* 3646: 1–37.

IUCN. 2016. *The IUCN Red List of Threatened Species*. Version 2016. Available at http:// www.iucnredlist.org.

Jones, D.P. & Kunz, T.H. 2000. *Pteropus hypomelanus*. *Mammalian Species,* 639: 1–6.

Kitchener, D.J. & Maryanto, I. 1995. Small *Pteropus* (Chiroptera: Pteropodidae) from Timor and surrounding islands, Indonesia. *Records of the Western Australian Museum*, 152: 147–152.

Kitchener, D.J., Packer, W. & Maharadatunkamsi. 1995. Morphological variation in *Pteropus lombocensis* (Chiroptera: Pteropodidae) in Nusa Tenggara, Indonesia. *Records of the Western Australian Museum*, 17: 61–67.

Kunz, T.H. & Jones, D.P. 2000. *Pteropus vampyrus*. *Mammalian Species,* 642: 1–6.

Lee, R. J., Gorog, A.J., Dwiyahreni, A., Siwu, S., Riley, J., Alexander, H., Paoli, G.D. & Ramono, W. 2005. Wildlife trade and implications for law enforcement in Indonesia: A case study from North Sulawesi. *Biological Conservation,* 123: 477–488.

Lee, T.E., Fisher, D.O., Blomberg, S.P. & Wintle, B.A. 2017. Extinct or still out there? Disentangling influences on extinction and rediscovery helps to clarify the fate of species on the edge. *Global Change Biology,* 23: 621–634.

Loughland, R.A. 1998. Mangal roost selection by the flying-fox *Pteropus alecto* (Megachiroptera: Pteropodidae). *Marine Freshwater Research,* 49: 351–352.

Markus, N. 2002. Behaviour of the black flying fox *Pteropus alecto*: 2. Territoriality and courtship. *Acta Chiropterologica,* 4: 153–166.

Markus, N. & Blackshaw, J.K. 2002. Behaviour of the black flying fox *Pteropus alecto*: 1. An ethogram of behaviour, and preliminary characterisation of mother-infant interactions. *Acta Chiropterologica,* 4: 137–152.

Markus, N. & Hall, L. 2004. Foraging behaviour of the black flying-fox (*Pteropus alecto*) in the urban landscape of Brisbane, Queensland. *Wildlife Research,* 31: 345–355.

Maryanto, I. & Kitchener, D.J. 1999. Mammals of Gag Island. *Treubia*, 31: 177–219.

Maryanto, I., Yani, M., Prijono, S. N. & Wiantoro, S. 2011. Altitudinal distribution of fruit bats (Pteropodidae) in Lore Lindu National Park, Central Sulawesi, Indonesia. *Hystrix: Italian Journal of Mammalogy,* 22: 167–177.

Mickleburgh, S., K. Waylen, and P. A. Racey. 2009. Bats as bushmeat: A global review. *Oryx,* 43: 217–234.

Mickleburgh, S.P., Racey, P.A. & IUCN/SSC Chiroptera Specialist Group. 1992. *Old World Fruit Bats: An Action Plan for Their Conservation*. Gland, Switzerland and Cambridge, UK.

Mickleburgh, S.P., Hutson, A.M. & Racey, P.A. 2002. A review of the global conservation status of bats. *Oryx* 36: 18–34.

Mildenstein, T.L., Stier, S.C., Nuevo-Diego, C.E. & Mills, L.S. 2005. Habitat selection of endangered and endemic large flying-foxes in Subic Bay, Philippines. *Biological Conservation,* 126: 93–102.

Mohd-Azlan, J., Zubaid, A. & Kunz, T.H. 2001. Distribution, relative abudance, and conservation status of the large flying fox, *Pteropus vampyrus*, in peninsular Malaysia: A preliminary assessment. *Acta Chiropterologica,* 3: 149–162.

Neaves, L.E., Danks, M., Lott, M.J., Dennison, S., Frankham, G.J., King, A., Eldridge, M.D.B., Johnson, R. N. & Divljan, A. 2018. Unmasking the complexity of species identification in Australasian flying-foxes. *PLoS ONE,* 13: 1–19.

Nurul-Ain, E., Rosli, H. & Kingston, T. 2017. Resource availability and roosting ecology shape reproductive phenology of rain forest insectivorous bats. *Biotropica,* 49: 382–394.

O'Malley, R., King, T., Turner, C.S., Tyler, S., Benares, J., Cummings, M. & Raines, P. 2006. The diversity and distribution of the fruit bat fauna (Mammalia, Chiroptera, Megachiroptera) of Danjugan Island, Cauayan, Negros Occidental, Philippines (with notes on the Microchiroptera). *Biodiversity and Conservation,* 15: 43–56.

Oo, K.S., Win, H.L., Bates, P.J.J. and Pearch, M.J. 2017. The ecology and distribution of flying foxes (Chiroptera: Pteropodidae: *Pteropus*) in Tanintharyi region, Myanmar with a first mainland record of *Pteropus hypomelanus geminorum* from Myeik. *Journal of Threatened Taxa,* 9: 10528–10537.

Paguntalan, L.M.J. & Jakosalem, P.G.C. 2004. Conserving threatened and endemic fruit bats in isolated forest patches in Cebu. *Silliman Journal,* 48: 81–94.

Palmer, C. & Woinarski, J.C.Z. 1999. Seasonal roosts and foraging movements of the black flying fox (*Pteropus alecto*) in the Northern Territory: resource tracking in a landscape mosaic. *Wildlife Research,* 26: 823.

Palmer, C., Price, O. & Bach, C. 2000. Foraging ecology of the black flying fox (*Pteropus alecto*) in the seasonal tropics of the Northern Territory, Australia. *Wildlife Research,* 27: 169–178.

Pangau-Adam, M., Noske, R. & Muehlenberg, M. 2012. Wildmeat or bushmeat? Subsistence hunting and commercial harvesting in Papua (West New Guinea), Indonesia. *Human Ecology,* 40: 611 –621.

Parsons, J.G., Van Der Wal, J., Robson, S.K.A. & Shilton, L.A. 2010. The implications of sympatry in the spectacled and grey headed flying-fox, *Pteropus conspicillatus* and *P. poliocephalus* (Chiroptera: Pteropodidae). *Acta Chiropterologica*, 12: 301–309.

Parsons, J.G., Cairns, A., Johnson, C.N., Robson, S.K.A., Shilton, L.A. & Westcott, D.A. 2006. Dietary variation in spectacled flying foxes (*Pteropus conspicillatus*) of the Australian Wet Tropics. *Australian Journal of Zoology,* 54: 417–428.

Phalen, D.N., Hall, J., Ganesh, G., Hartigan, A., Smith, C., de Jong, C., Field, H. & Rose, K. 2018. Genetic diversity and phylogeny of the Christmas Island flying fox (*Pteropus melanotus natalis*). *Journal of Mammalogy*, 98: 428–437.

Phillips, P., Hauser, P. & Letnic, M. 2007. Displacement of black flying-foxes *Pteropus alecto* from Batchelor, Northern Territory. *Australian Zoologist,* 34: 119–124.

Riley, J. 2002. Mammals on the Sangihe and Talaud Islands, Indonesia, and the impact of hunting and habitat loss. *Oryx,* 36: 288–296.

Roberts, B.J., Catterall, C.P., Eby, P. & Kanowski, J. 2012. Latitudinal range shifts in Australian flying-foxes: A re-evaluation. *Australian Ecology,* 37: 12–22.

Saroyo. 2011. Konsumsi mamalia, burung, dan reptil liar pada masyarakat Sulawesi Utara dan aspek konservasinya (Consumption of wild mammals, birds, and reptiles in North Sulawesi communities, and aspects of their conservation). *Bioslogos,* 1: 25–31.

Scheffers, B.R., Corlett, R.T., Diesmos, A. & Laurance, W.F. 2012. Local demand drives a bushmeat industry in a Philippine forest preserve. *Tropical Conservation Science,* 5: 133–141.

Sheherazade & Tsang, S.M. 2015. Quantifying the bat bushmeat trade in North Sulawesi, Indonesia, with suggestions for conservation action. *Global Ecology and Conservation,* 3: 324–330.

Sheherazade & Tsang, S.M. 2018. Roost of gray flying foxes (*Pteropus griseus*) in Indonesia and records of a new hunting threat. *Diversity,* 10: 102.

Sheherazade, Ober, H.K. & Tsang, S.M. 2019. Contributions of bats to the local economy through durian pollination in Sulawesi, Indonesia. *Biotropica,* 51: 913–922.

Shilton, L.A., Latch, P.J., McKeown, A., Pert, P. & Westcott, D.A. 2008. Landscape-scale redistribution of a highly mobile threatened species, *Pteropus conspicillatus* (Chiroptera, Pteropodidae), in response to Tropical Cyclone Larry. *Australian Ecology,* 33: 549–561.

Simmons, N.B. 2005. Order Chiroptera. In: D.E. Wilson & D.M. Reeder, eds. *Mammal Species of the World: A Taxonomic and Geographic Reference, Third Edition*. Baltimore: Johns Hopkins University Press: pp. 312–529.

Soegiharto, S. 2009. *Identifikasi Jenis Tumbuhan Pakan Dalam Upaya Konservasi Kelelawar Pemakan Buah dan Nektar di Daerah Perkotaan: Studi Kasus Kelelawar di Kebun Raya Bogor (Identification of Consumed Plant Species in Conservation Efforts for Fruit and Nectar Eating Bats in Urban Areas: Case Study of Bats in Bogor Botanical Gardens)*. M.S. Thesis, Institut Pertanian Bogor (Bogor Agricultural University), 102 pp.

Stier, S.C. & Mildenstein, T.L. 2005. Dietary habits of the world's largest bats: the Philippine flying foxes, *Acerodon jubatus* and *Pteropus vampyrus lanensis*. *Journal of Mammalogy,* 86: 719–728.

Struebig, M.J., Harrison, M.E., Cheyne, S.M. & Limin, S.H. 2007. Intensive hunting of large flying foxes *Pteropus vampyrus natunae* in Central Kalimantan, Indonesian Borneo. *Oryx,* 41: 390–393.

Tait, J., Perotto-Baldivieso, H.L., McKeown, A. & Westcott, D.A. 2014. Are flying-foxes coming to town? Urbanisation of the spectacled flying-fox (*Pteropus conspicillatus*) in Australia. *PLoS ONE,* 9: 1–8.

Tanalgo, K.C. 2017. Wildlife hunting by indigenous people in a Philippine protected area: A perspective from Mt. Apo National Park, Mindanao Island. *Journal of Threatened Taxa,* 9: 10307–10313.

Thong, V.D., Tung, N.T. & Thanh Tinh, N.T. 2015. First ecological data of flying foxes of the genus *Pteropus* (Chiroptera: Pteropodidae) in Vietnam. *Tap Chi Sinh Hoc,* 37: 312–316.

Todd, C.M., Westcott, D.A., Rose, K., Martin, J.M. & Welbergen, J.A. 2018. Slow growth and delayed maturation in a Critically Endangered insular flying fox (*Pteropus natalis*). *Journal of Mammalogy*, 99: 1510–1521.

Tsang, S.M. 2016a. *Pteropus chrysoproctus*. In *IUCN Red List of Threatened Species*.

Tsang, S.M. 2016b. *Pteropus lombocensis*. In *IUCN Red List of Threatened Species*.

Tsang, S.M. 2016c. *Pteropus ocularis*. In *IUCN Red List of Threatened Species*.

Tsang, S.M. & Sheherazade. 2016. *Acerodon celebensis*. In The IUCN Red List of Threatened Species.

Tsang, S.M., Wiantoro, S. & Simmons, N.B. 2015. New records of flying foxes (Chiroptera: *Pteropus* sp.) from Seram, Indonesia, with notes on ecology and conservation status. *American Museum Novitates,* 3842: 1–23.

Tsang, S.M., Cirranello, A.L., Bates, P.J.J. & Simmons, N.B. 2016. The roles of taxonomy and systematics in bat conservation. In: C. C. Voigt & T. Kingston, eds. *Bats in the Anthropocene: Conservation of Bats in a Changing World*. Springer: pp. 503–538.

Tsang, S.M., Wiantoro, S., Veluz, M.J., Simmons, N.B. & D. J. Lohman. 2018. Low levels of population structure among geographically distant populations of *Pteropus vampyrus* (Chiroptera: Pteropodidae). *Acta Chiropterologica*, 20: 59–71.

Tsang, S.M., Wiantoro, S., Veluz, M.J., Sugita, N., Nguyen, Y.-L., Simmons, N.B. & Lohman, D. J. 2019. Dispersal out of Wallacea spurs diversification of *Pteropus* flying foxes, the world's largest bats (Mammalia: Chiroptera). *Journal of Biogeography,* 00: 1–11.

Vardon, M.J. & Tidemann, C.R. 2000. The black flying-fox (*Pteropus alecto*) in north Australia: Juvenile mortality and longevity. *Australian Journal of Zoology,* 48: 91–97.

Vardon, M. J., Brocklehurst, P.S., Woinarski, J.C.Z., Cunningham, R.B., Donnelly, C.F. & Tidemann, C.R. 2001. Seasonal habitat use by flying-foxes, *Pteropus alecto* and *P. scapulatus* (Megachiroptera), monsoonal Australia. *Journal of Zoology,* 253: 523–535.

Wang, L.-F., Mackenzie, J.S. & Eaton, B.T. Disease outbreaks caused by emerging paramyxoviruses of bat origin. In: Y. Lu, M. Essex, & B. Roberts, eds. *Emerging Infections in Asia*. Springer: pp. 193–208.

Webb, N.J. & Tidemann, C.R. 1995. Hybridization between black (*Pteropus alecto*) and grey-headed (*P. poliocephalus*) flying-foxes (Megachiroptera: Pteropodidae). *Australian Mammalogy,* 18: 19–26.

van Weerd, M. & Guerrero, J. 2003. *Flying foxes of the Northern Sierra Madre Natural Park, Northeast Luzon. The Sierra Madre Mountain Range: Global Relevance, Local Realities*, 10 pp.

Westcott, D.A., Caley, P., Heersink, D.K. & McKeown, A. 2018. A state-space modelling approach to wildlife monitoring with application to flying-fox abundance. *Scientific Reports,* 8: 4038.

Wiantoro, S. & Maryanto, I. 2016. Morphological and genetic studies of the masked flying fox, *Pteropus personatus*; with a new subspecies description from Gag Island, Indonesia. *Treubia,* 43: 31–46.

Win, S. S. & Mya, K.M. 2015. The diet of the Indian flying fox *Pteropus giganteus* (Brünnich. 1782) (Chiroptera: Pteropodidae) in Myanmar - conflicts with local people? *Journal of Threatened Taxa*, 7: 7568–7572.

Woinarski, J.C.Z., Flakus, S., James, D.J., Tiernan, B., Dale, G.J. & Detto, T. 2014. An island-wide monitoring program demonstrates decline in reporting rate for the Christmas Island Flying-Fox *Pteropus melanotus natalis*. *Acta Chiropterologica,* 16: 117–127.

Appendices

Appendix 1. All literature cited for each flying fox species used to categorize priorities in Table 1. For *P. griseus*, we included Goodwin (1979) as "new" literature because the Old World Action Plan (Mickleburgh, 1992) did not recount ecological information for this species under the species account.

Species	Citations
Genus *Pteropus*	
P. alecto	(Webb and Tidemann, 1995; Loughland, 1998; Palmer and Woinarski, 1999; Vardon and Tidemann, 2000; Palmer et al., 2000; Vardon et al., 2001; Markus, 2002; Markus and Blackshaw, 2002; Helgen, 2004; Markus and Hall, 2004; Fox, 2006; Phillips et al., 2007; Saroyo, 2011; Maryanto et al., 2011; Roberts et al., 2012; Sheherazade and Tsang, 2015; Neaves et al., 2018; Sheherazade et al., 2019; Tsang et al., 2019)
P. aruensis	(Lee et al., 2017)
P. caniceps	(Flannery, 1995; Tsang et al., 2019)
P. chrysoproctus	(Flannery, 1995; Tsang et al., 2015, 2019; Tsang, 2016a)
P. conspicillatus	(Webb and Tidemann, 1995; Fox, 2006; Parsons et al., 2006, 2010; Fox et al., 2008, 2012; Shilton et al., 2008; Almeida et al., 2014; Tait et al., 2014; Neaves et al., 2018; Westcott et al., 2018; Tsang et al., 2019)
P. hypomelanus	(Flannery, 1995; Jones and Kunz, 2000; Bastian Jr. et al., 2002; Colgan and da Costa, 2002; Saroyo, 2011; Almeida et al., 2014; Thong et al., 2015; Aziz et al., 2017c, 2017b, 2017a; Oo et al., 2017)
P. griseus	(Goodwin, 1979; Kitchener and Maryanto, 1995; Mickleburgh et al., 2009; Saroyo, 2011; Almeida et al., 2014; Sheherazade and Tsang, 2018; Tsang et al., 2019)
P. keyensis	(Flannery, 1995)
P. lombocensis	(Kitchener and Maryanto, 1995; Kitchener et al., 1995; Mickleburgh et al., 2009; Almeida et al., 2014; Tsang, 2016b; Tsang et al., 2019)
P. macrotis	(Flannery, 1995; Almeida et al., 2014)
P. melanopogon	(Flannery, 1995; Tsang et al., 2015)
P. melanotus	(Aul et al., 2014; Flakus et al., 2014; Woinarski et al., 2014; Phalen et al., 2018; Todd et al., 2018)
P. neohibernicus	(Flannery, 1995; Bonaccorso, 1998; Breed et al., 2010; Pangau-Adam et al., 2012; Almeida et al., 2014; Fatem et al., 2014; Tsang et al. 2019)
P. ocularis	(Tsang et al., 2015, 2019; Tsang, 2016c)
P. personatus	(Flannery, 1995; Maryanto and Kitchener, 1999; Almeida et al., 2014; Wiantoro and Maryanto, 2016; Tsang et al., 2019)
P. pohlei	(Almeida et al., 2014; Flannery, 1995)
P. pumilus	(Bastian Jr. et al., 2002; Riley, 2002; Paguntalan and Jakosalem, 2004; O'Malley et al., 2006; Alcazar et al., 2008; Almeida et al., 2014; Deligero, 2018; Tsang et al., 2019)
P. speciosus	(Bastian Jr. et al., 2002; Almeida et al., 2014)
P. temminckii	(Flannery, 1995; Helgen and Bonaccorso, 2013; Tsang et al., 2015, 2019)
P. vampyrus	(Kunz and Jones, 2000; Mohd-Azlan et al., 2001; Bastian Jr. et al., 2002; van Weerd and Guerrero, 2003; Gumal, 2004; Paguntalan and Jakosalem, 2004; Cayunda et al., 2004; Esselstyn et al., 2004; Mildenstein et al., 2005; Stier and Mildenstein, 2005; Struebig et al., 2007; Soegiharto, 2009; Epstein et al., 2009; Breed et al., 2010; Harrison et al., 2011; Scheffers et al., 2012; Croes, 2012; Clements, 2013; Almeida et al., 2014; Bennett and Roth, 2015; Chng et al., 2015, 2016; Tanalgo, 2017; Tsang et al., 2018, 2019)
Genus *Acerodon*	
Acerodon celebensis	(Almeida et al., 2014; Flannery, 1995; Riley, 2002; Lee et al., 2005; Mickleburgh et al., 2009; Saroyo, 2011; Sheherazade and Tsang, 2015, 2018; Tsang and Sheherazade, 2016; Sheherazade et al., 2019; Tsang et al., 2019)
Acerodon humilis	(Flannery, 1995; Riley, 2002; Lee et al., 2005)
Acerodon mackloti	(Tsang et al., 2019)
Other Pteropodini	
Neopteryx frosti	(Almeida et al., 2014; Sheherazade and Tsang, 2015)
Styloctenium wallacei	(Esselstyn, 2007; Mickleburgh et al., 2009; Maryanto et al., 2011)

INSTRUCTIONS FOR AUTHORS

TREUBIA is a peer-reviewed, scientific zoological journal with focus on biosystematic aspects of terrestrial and aquatic fauna in the Indo-Australian region. TREUBIA is published yearly and accepts manuscripts within the scope of the journal. It is accessible online at http://e-journal.biologi.lipi.go.id/index.php/treubia.

The missions of TREUBIA are to: (1) promote sciences and disseminate information in animal systematics and on the biodiversity of the region; (2) participate in the effort of educating public through good quality of scientific media and available professional researchers; (3) establish linkages among zoologists particularly in the field of systematics.

TREUBIA accepts manuscripts based on original research, taxonomic review or short communication. The manuscript should not be offered for prior or simultaneous publication elsewhere. It must be written in English and should use the American English spelling. Manuscripts should be prepared double-spaced in Microsoft Word, using Times New Roman font 12, A4 paper size. Template is available through e-journal. An electronic file of the manuscript along with a formal cover letter – indicating the importance, stating its originality and its approval by all co-authors – should be submitted to the editors of TREUBIA through http://e-journal.biologi.lipi.go.id/index.php/treubia or through email address: treubia@gmail.com.

Concise writing is recommended. All numbers under 10 and any number forming the first word of a sentence must be spelled out, except in the Materials and Methods section of taxonomic papers. Year should be completely written. Names of genera and species should be in italic type. It is recommended to use metric measurements in abbreviation (for examples: kg, cm, ml). Please consult and refer to a recent issue of TREUBIA for an acceptable format. Please note that starting in 2018, we adopt Mendeley reference management application, with Harvard referencing style.

Manuscripts should be presented in the following order (with Conclusions and Appendices if necessary):

Title section. This includes the title of the paper (all capitalized), author's full name, author's institution and address (all with first letters capitalized), and e-mail address of the corresponding author. The title should be short, informative and without abbreviation.

Abstract. Except for short communications, articles should be accompanied by an abstract. The abstract consists of no more than 250 words in one paragraph which should clearly state the essence of the paper, with no references cited.

Keywords. Following the abstract, list up to 5 keywords, all typed in lowercase except a proper noun, separated by commas, presented in alphabetical order.

Introduction. The introduction must briefly justify the research and give the objectives. References related to the justification of the research should be cited in the introduction but extensive and elaborate discussion of relevant literature should be addressed in the Discussion section. References are to be cited in the text by the author's surname and year of publication. When citing multiple sources, place them in chronological order, for example: (Glaubrecht, 1999, 2006; Glaubrecht et al., 2009; Maaβ & Glaubrecht, 2012). For two authors, both names should be cited. For three authors or more, only the first author is given followed by et al.

Materials and Methods. Provide a clear explanation of materials and methods used in the research. The place of specimen depository should be mentioned here.

Results. The results can be presented in the form of tables and figures when appropriate. The text should explain and elaborate the data presented. Captions of tables, figures, and plates should be inserted where you want them to be inserted. All line drawings, photographs and other figures should be submitted separately in JPEG format and the image size should be at least 1024 by 768 pixels.

Discussion. The discussion should interpret the results clearly and concisely, and should discuss the findings in relation with previous publications.

Acknowledgments. Acknowledgments of grants, assistance and other matters can be written in one paragraph.

References. List of references should be in alphabetical order by the first or sole author's surname. Journal references should include author's surname and initials, year of publication, title of the paper, full title of the journal (typed in *italic*), volume number and inclusive page numbers. Book references should include author's surname and initials, year of publication, title of the book (typed in *italic*) or/and title of the chapter and editor (if part of a book), publisher, city of publication, and page numbers.

For example:

Eaton, J.A., van Balen, B., Brickle, N.W. & Rheindt, F.E. 2016. *Birds of the Indonesian Archipelago: Greater Sundas and Wallacea*. 1st ed. Barcelona: Lynx Edicions.

LaSalle, J. & Schauff, M.E. 1994. Systematics of the tribe Euderomphalini (Hymenoptera: Eulophidae): parasitoids of whiteflies (Homoptera: Aleyrodidae). *Systematic Entomology*, 19: 235–258.

MacKinnon, J. & Phillips, K. 1993. *Field Guide to the Birds of Borneo, Sumatra, Java and Bali*. Oxford: Oxford University Press: 491 pp.

Natural History Museum 2013. Wallace100 - celebrating Alfred Russel Wallace's life and legacy. http://www.nhm.ac.uk/nature-online/science-of-natural-history/wallace/index.html 11 October 2013.

Higgins, P., Christidis, L., Ford, H. & Bonan, A. 2017. Honeyeaters (Meliphagidae). In: J. del Hoyo, A. Elliott, J. Sargatal, D.A. Christie & E. de Juana, eds. *Handbook of the Birds of the World Alive*. Barcelona: Lynx Edicions. http://www.hbw.com.

Upon receiving a manuscript, a Treubia editor will check the compliance with these instructions and will send the manuscript to two reviewers. Based on comments from the reviewers and the suitability of the manuscript, Treubia editors will decide the acceptance or rejection of the manuscript. The author will be notified of the decision and will receive the manuscript with reviewers' comments.

Following the process of reviewing and revising, a final proof will be sent to the first or sole author for correction and approval. Five reprints are supplied free of charge but delivery cost will be charged. Joint authors will have to divide these copies among them at their discretion. Additional reprints can be provided at cost, the order should be placed before the final printing.

VOL. 46, DECEMBER 2019

CONTENT