

Human interaction with bats in Batu Putih Village Tangkoko North Sulawesi and the zoonosis risk

by Tiltje Ransalele 6

Submission date: 26-Aug-2022 10:12AM (UTC+0700)

Submission ID: 1887234958

File name: Human_interaction_with_bats_in_Batu_Putih_Village.pdf (1.02M)

Word count: 3982

Character count: 21596

PROCEEDING

The International Webinar of The Indonesian Society of Biochemistry and Molecular Biology and

The University Center of Excellence for Biotechnology and Conservation of Wallacea

Emerging Infectious Diseases: An Interdisciplinary Practical Approach

September 3, 2020

Organized by:



PIU-PT Pusat Studi Bioteknologi dan Konservasi Kawasan Wallacea
University Center of Excellence for Biotechnology and Conservation of Wallacea
UNIVERSITAS SAM RATULANGI



The Indonesian Society for
Biochemistry and
Molecular Biology

PROCEEDING

The International Webinar of The Indonesian Society of Biochemistry and Molecular Biology and The University Center of Excellence for Biotechnology and Conservation of Wallacea

Emerging Infectious Diseases: An Interdisciplinary Practical Approach

September 3, 2020

Organized by:



PUI-PT Pusat Studi Bioteknologi dan Konservasi Kawasan Wallacea
University Center of Excellence for Biotechnology and Conservation of Wallacea
UNIVERSITAS SAM RATULANGI



The Indonesian Society for
Biochemistry and
Molecular Biology



PUSAT
UNGGULAN
IPTeKS
PERGURUAN
TINGGI



LPPM

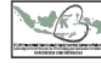
Live via



Sponsored by:



SANBE



Committee

Steering Committee

16

Prof. dr. Ali Ghufron Mukti, M.Sc., Ph.D.

Prof. Montarop Yamabhai

Hansoo Kim, BSc, MSc

Talha bin Emran, Ph.D

Prof. Dr. Debbie S. Retnoningrum

Prof. Dr. Julius Pontoh

Prof. Dr. Marie Sandoval

Prof. Dr. Charles L. Kaunang

Prof. Dr. Benny Pinontoan

Prof. Dr. dr. Billy Kepel

Dr. Rahmawati Ridwan

Dr. Ratna Siahaan, M.Si.

Organizing Committee

Prof. Dr. Trina Tallei

dr. Stefana Kaligis, MSc

dr. Aryani Adji

Dra. Nio Song Ai, PhD

Dr. Nurdjannah Niode, SpKK

Dr. Diana Shinta Purwanto

Beivy J. Kolondam, SSi, MSi

Stenly Wullur, PhD

Roike I. Montolalu, PhD

Editor

Maureen Kumaunang



Contents

17 Aris Purwanto, Wayan Tunas Artama, Bambang Sumiarto, Adi Heru Husodo, Nabila Cahyarani, Riandanu Dharmawan, Elkautsar Rizqi Ramadhanti Practical toxoplasmosis detection of goat meats based on nucleic acids amplification of the B1 gene.....	1
Arif Wicaksono, Arina Nurfiati Promoting COVID-19 prevention and control.....	7
Fatimawali, Billy Kepel, Widdhi Bodhi, Trina Ekawati Tallei Secondary metabolites and antimalarial activity test of Betel Leaf (<i>Piper betle</i> Linn.) from Nort Sulawesi.....	11
Frans Wantania Association between lymphocyte count and Gensini score in elderly patients.....	19
Tiltje Andretha Ransaleleh , Meis Jacinta Nangoy, Trina Ekawati Tallei Captivity Study of the bat <i>Pteropus alecto</i>	25
Meis Jacintha Nangoy, Tiltje Andretha Ransaleleh, Indyah Wahyuni, Hanry Lengkong, Roni Koneri, Trina Ekawati Tallei Human interaction with bats in Batu Putih Village Tangkoko North Sulawesi and the zoonosis risk	34
13 Arthur H.P. Mawuntu, Riane Anggreani, Janno J. Bernadus, Agung Wiyatno, Feliana, Rama Dhenni, Ungke Antonjaya, Frilasita A. Yudhaputri, Chairin Nisa Ma'roef, Aghnianditya K. Dewantari, Araniy Fadhilah, Dodi Safari, Khin Saw Myint Depicting brain infection in non-HIV patients in Manado, North Sulawesi, Indonesia: building better awareness of the disease	42
Andrew Hukom, Lie Hendratta, Paul Harijanto, Linda Rotty Convalescent plasma therapy in COVID-19.....	49
Ribka Wowor Association of mean platelet volume with the lipid profile in young adults with central obesity.....	60



The International Webinar of
The Indonesian Society for Biochemistry and Molecular Biology (Manado Branch) and
The University Center of Excellence for Biotechnology and Conservation of Wallacea
(Universitas Sam Ratulangi)
3 September 2020

Sylvia Laatung, A M Fuah, B Masy'ud, C Sumantri, S Dohong	
Intensive hunting of white-tailed rat and the risk of zoonotic diseases transmission	67
Inneke F M Rumengan, Aldian Hein Luntungan	
<i>In silico</i> simulation of cyclic peptides derived from marine bacterial symbiont as potential inhibitors of SARS-CoV-2 main protease	73



Human interaction with bats in Batu Putih Village Tangkoko North Sulawesi and the zoonosis risk

Meis Jacinta Nangoya^{a*}, Tiltje Andretha Ransaleleha^a, Indyah Wahyuni^a, Hanry
Lengkong^b, Roni Koneri^b, Trina Ekawati Tallei^b

^a Animal Science Faculty, Sam Ratulangi University

^b Department of Biology, Mathematic and Natural Science Faculty, Sam Ratulangi University, Indonesia

*Corresponding author: mnangoy@unsrat.ac.id

Abstract. Bats are a reservoir for zoonotic diseases. Human interactions with bats such as living on the edge of the forest, hunting and consuming their meat have the potential to cause new diseases. Research has been carried out to obtain contact information for humans and bats in the village of Batuputih Bawah, on the border of the Tangkoko forest North Sulawesi. The data and information were obtained through observations and interview with the residents that had bat food trees in their yards. Based on observations, species of bats that visit the house yards are *Thoopterus nigrescens*, *Cynopterus minutus*, *Nyctimene cephalotes*, *Rousettus celebensis*, *Macroglossus minimus*. Thirty home yards have fruit trees which are food for bats (*Mangifera indica* (100%), *Musa* sp. (83.3%), *Carica papaya* (50%), *Nephelium lappaceum* (30%), *Psidium guajava* (5%), and *Artocarpus altilis* (5%). Twenty houses have palm trees (*Arenga pinnata*) on their back yards. Ten houses have *Terminalia catappa* trees. Bats are mostly seen before sundown. The results of the interview showed that falling fruits with bat bites are collected and used as animal feed. It can be concluded that there is a high interaction between human and bats in Batu Putih Village Tangkoko and they are at risk of zoonosis from bats. Education and an integrated system are needed for managing the health of forest fringe communities who have close contacts with bat.

Keywords: bat, zoonotic, North Sulawesi

Introduction

Batuputih is a village located on the beach and directly adjacent to the Dudasudara Mount conservation area, North Sulawesi Province. This village is known as a tourist village because it has beautiful beaches and as a place to stay for tourists visiting the Nature Tourism Park (NTP). The Batuputih NTP area is one of the habitats for various endemic animals of Sulawesi Geographical location adjacent to the forest, especially settlements adjacent to the area, is generally subject to disturbance by wild animals that come looking for food. This incident caused conflict and interaction between the population and wildlife. The residents must be aware of this interaction given the potential for exposure to diseases originating from wild animals, especially from bats.

Various types of wildlife such as bats, although they have an ecological function as seed dispersers, pollinators, and mosquito predators, they also act as reservoirs for disease. Bats are among the wild animals that have received much attention from a global public health perspective because they are associated with the transmission of infectious diseases caused by viruses. Various infectious diseases caused by viruses such as Ebola, Marburg, Nipah, Severe Acute Respiratory Syndrome (SARS) Co-V and the Middle East Respiratory Syndromes (Mers Co-V) were found to come from bats [1], [2]. However, research on the impacts of wildlife diseases and interactions with livestock and ecology in relation to communities has not been widely studied [3]. Therefore, this study aimed to examine how human contact with bats and to assess the risk of exposure to zoonotic diseases and to raise awareness about how to live side by side with bats.



Material and Methods

Location and respondents

Sampling was carried out in the yard of a resident's house adjacent to the Batuputih NTP. The number of samples was 30 residential yards. In each yard, the type and number of fruit trees that are used for bat food were identified. In the yard, the number and types of bats were also observed for 3 nights, from 06.00 PM to 06.00 AM. Observation of bats was carried out by attaching a mist net measuring 8 m long and 3 m wide. The net was installed at a height of 3 m from the ground.

Data was also obtained through interviews with communities around the area. The interviewed respondents consisted of 10 tour guides, 7 breeders, 7 innkeepers, 5 sap processors, and 4 fishermen. Interview was conducted to obtain information about the presence of bats visiting the village, knowledge of bat nests, habit of consuming bats, and management of fruit bites. Respondents who had the most contact with bats were given knowledge about coexistence with bats. The method given was in the form of lectures and discussions at the restaurant owned by the head of the NTP Tangkoko resort using the Covid19 protocol.

This research was done by using descriptive method. Data and information were presented in narrative form and tables and figures. Conclusions was done by comparing the data and information with others research and publications.

Results and discussion

Types and number of bats that visit the yard

The number of bats found in this study was 42 individuals consisting of 5 types of fruit-eating bats. The types of bats found belong to the Pteropodidae family, including *Thoopterus nigrescens*, *Cynopterus minutus*, *Nyctimene cephalotes*, *Rousettus celebensis*, and *Macroglossus minimus*. The most common type of bat found was *T. nigrescens*, then *C. minimus*, while the least species of bat was *M. minimus* (Table 1). The number of species found in this study was lower when compared to the results of research conducted in the Tangkoko conservation area by Lengkong [4] which found 9 species. The average catch per night was 14 individuals with a standard deviation of 4.35 (Table 1).

Based on the data, it can be seen that there are 5 types of bats that visit and eat fruit in the yard of residents' houses. The visiting bats belong to the Pteropodidae family. According to Pillai et al. [5], the Pteropodidae family is a bat reservoir for the Nipah virus which has caused outbreaks in Malaysia, Bangladesh and India. Yang et al. [6] found the bat genus *Rousettus* as a reservoir for filoviruses. The genera *Rousettus* and *Cynopterus* are reported as reservoirs for the Marburg virus. *Cynopterus brachyotis* and *Macroglossus sobrinus* as reservoirs for Leptospirosis [7].

Table 1. Number and types of bats visiting the house yard

No	Species	Repetition			Total	Average	StD
		1	2	3			
1	<i>Thoopterus nigrescens</i>	5	4	8	17	5.66	2.08
2	<i>Cynopterus minutus</i>	4	5	4	13	4.33	0.57
3	<i>Nyctimene cephalotes</i>	2	2	2	6	2.00	0.00
4	<i>Rousettus celebensis</i>	1		4	5	1.66	2.08
5	<i>Macroglossus minimus</i>	-	-	3	3	1	1.73
	Total	12	11	19	42	14.00	4.35



Types and percentages of forage trees

There were 8 types of fruit plants as bat food found in people's homes (Table 2). Fruit plants that are often found in the yard were mango (*Mangifera indica*) with a frequency of 100%. Other fruit crops were banana (*Musa* sp.), Aren (*Arenga pinnata*), Papaya (*Carica papaya*), Ketapang (*Terminalia cattapa*), Rambutan (*Nephelium lappaceum*), Guava (*Psidium guajava*) and Breadfruit (*Artocarpus altilis*) (Table 2). The average distance between the fruit trees is less than 10 meters.

Some of the plants found in people's yards that bear fruit at any time were bananas (*Musa* sp.), Sugar palm (*Arenga pinnata*), Papaya (*Carica papaya*), Ketapang (*Terminalia cattapa*), Guava (*Psidium guajava*), and Breadfruit (*Artocarpus altilis*). The fruit plants were visited by bats every day to get food as a source of energy. Bats for their daily activities require energy from fruits, nectar, as well as fruit juice, and Sugar palm sap. *Arenga pinnata*, *Musa* sp, *Carica papaya* are plants that bear fruit without a certain season [8]. It is also found in Bangladesh that bats visit home yards to eat fruits such as *Mangifera indica* and *Nephelium lappaceum* causing disturbance to settlements [9]. In Australia bats visit farmlands and orchid plantations to suck nectar [10].

Table 2. Types and percentage of houses planting fruit trees

No	Types of fruit trees	Percentage
1	<i>Mangifera indica</i>	100
2	<i>Musa</i> sp	83,3
3	<i>Arenga pinnata</i>	66,3
4	<i>Carica papaya</i>	50
5	<i>Terminalia cattapa</i>	33,3
6	<i>Nephelium lappaceum</i>	30
7	<i>Psidium guajava</i>	5
8	<i>Artocarpus altilis</i>	5

Roosting area

Based on interviews from tour guides, it is known that in the conservation area there were 10 roosting trees (hole trees) and 7 caves located on the edge of the beach, and several species live under the fronds of woka trees (*Livistona altissima*), a type of palm with broad leaves and under forest banana fronds. The distance between roosting area and the village was approximately 2-4 km. This fruit-eating bat has the ability to fly up to 20-50 km in search of food [8].

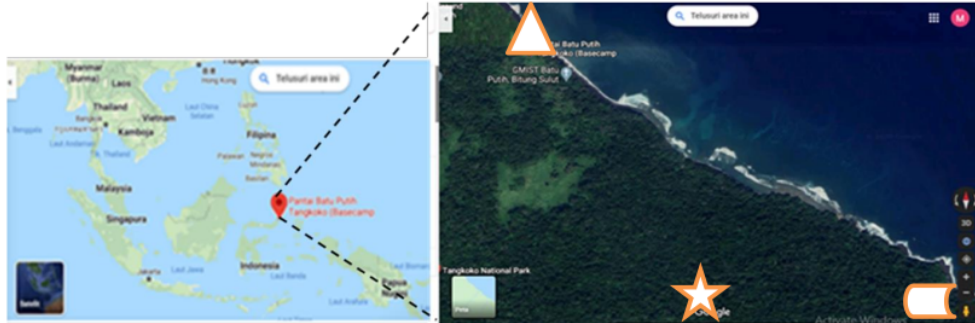





Figure 1. Roosting Area of bats in the Tangkoko Conservation Area

Batu Putih Village  Roosting Tree  Bat cave 

Respondents interaction with bats


The results of interviews with respondents of pig breeders, information was obtained that the fruit damaged by bat bites was used as pig feed. Based on observations in the village, there were 5 sap processors and pig breeders who were a group that had a risk of exposure to disease from bats. In India there was an and. In Malaysia (1998-1999) there was a transmission of the Nipah virus due to livestock feeding mango bites from bats [11]. In India 2001, Bangladesh (2001-2005) there was outbreak of the Nipah virus disease cause  human contact with bats through sap water contaminated with bat saliva [12]. According to Pillai [5], different locations have different routes of transmission. Human-bat interaction studies have become a concern in Australia regarding the Lyssa virus, including Rabies, which infects orchid flower farmers with clinical symptoms of encephalitis [10].



Figure 2. Pig cage (A), and bat-bite papaya fruit as pig feed (B)



Figure 3. Nira processing farmer (A), Pig farmer (B)



Public awareness about the risk of disease from bats

Batuputih residents have interactions with bats. Public awareness aimed at reducing the risk of contracting disease from bats has been carried out in the same way as in Bangladesh, Cambodia, Cameroon, Ivory Coast, DRC, Ghana, Guinea, Lao PDR, Malaysia, Myanmar, Nepal, ROC, Senegal, Sierra Leone, Tanzania, Thailand, and Vietnam, which are the countries where the population has interaction with bats using the "safe living side by side with bats" material through the activities of the Sam Ratulangi University partnership program (Figure 4). This material is campaign material in Bangladesh, Cambodia, Cameroon, Ivory Coast, DRC, Ghana, Guinea, Indonesia, Lao PDR, Malaysia, Myanmar, Nepal, ROC, Senegal, Sierra Leone, Tanzania, Thailand, and Vietnam [13].



Figure 4. Awareness activities about the dangers of disease from wild animals

The awareness materials about living safely side by side with bats include:

1. Reminded to avoid being exposed to bats' bodily fluids such as saliva, blood, urine or feces, and to prevent bats from living in houses or buildings (perches or "nests").
2. Not consuming food or drinking water that has been in contact with urine or bat droppings. For example, you can cover your food and drinks and don't forget to regularly wash those desserts using soap and tap water.
3. To reduce the risk of falling ill, avoid eating fruits that have been partially bitten by wild animals or livestock.
4. Don't even eat or drink something that you believe has been in contact with an animal. Do not store fruit that has been bitten by bats by removing the visible part of the bite, and do not give these fruits to your livestock. All parts of the fruit may have been contaminated and could make you sick.
5. This also applies to tapped palm sap / coconut water. Do not drink sap / coconut water that has been touched by bats. If you have no way to protect the palm sap / coconut water from exposure to bats or body fluids, make sure you don't drink it.
6. Bats often live and nest in the trees around your house. When the animals on the farm eat or rest under trees inhabited by bats, the bat urine or feces can fall on the animals' bodies and also



their food. This can make them sick. If you have animals, you should find the best way to ensure that your animals eat and sleep under trees where bats are not present. Livestock should be kept away from areas where bats live. Bat manure should be handled and kept away from humans, livestock and other animals.

Before and after the training, participants in this community partnership program were given a questionnaire to measure their level of understanding of the material provided. In general, it can be concluded that the participants understand the dangers of diseases originating from wild animals. However, these activities are not sufficient to prevent the occurrence of diseases from wild animals which are highly influenced by various factors such as climate change and ecosystem changes due to habitat destruction caused by forest fires. Therefore it is necessary to integrate the decisions that drive human – environment interactions with ecological and epidemiological research in an interdisciplinary approach to understanding pathogen transmission, so as to inform the policy needed to improve both conservation and disease spread outcomes. This is in line with what Van der Poel *et al.* [14] stated that awareness of the dangers of disease emergence from bats needs to be done in Europe through surveillance activities for early detection of the dangers of disease emergence.

In Malaysia, research on Knowledge, Attitude and Practice on Bats-Borne Diseases among Village Residents was conducted on 100 respondents with questions related to knowledge of diseases in bats. The results showed that the majority (80%) of respondents were not aware that bats can cause rabies, and 84% did not know about rabies vaccination. The result of this pilot study provides a limited but valuable insight into bat-related infection. Overall, respondents had good knowledge, attitude and practice scores towards bats-related infection. However, more awareness is needed to key areas lacking such as in educating awareness about rabies in bats [15]. In Australia, awareness raising has been made on orchid flower farmers. In addition, studies were also carried out to evaluate the effectiveness of awareness raising activities and to evaluate the effectiveness of awareness-raising communications related to content and delivery methods (Quinn *et al.* 2018)[10]. In China, which is the first country of the COVID-19 pandemic, studies have been carried out on various risk factors for zoonotic diseases in South China in rural communities who live side by side with domestic animals and livestock. The results of the study concluded that behavior change is the main key in the prevention of zoonotic diseases [16].

Conclusion

The interaction between humans and bats in Batuputih village is high and there is the potential for human wildlife disease to occur. The most high risk zoonosis is the house has variety fruits (palm tree, papaya, banana). The most high interaction and risk is sugar palm and pig farmer. Continuous monitoring steps are needed to determine whether the awareness that has been carried out can change the behavior and culture of consuming wildlife. In addition, the people of Batuputih Village need the support of a good and well health system that is fast and accurate, so that the incidence of wildlife disease to humans can be prevented, such as an early warning system for wildlife disease incidents by the government that must be developed and implemented. Research on the identification of pathogens in wild animals is important for surveillance of zoonotic diseases.

Acknowledgement

The authors wish to thank Rector Unsrat and Head of Research and Community Service Institution for providing PNBP funding through the Basic Research Project entitled "Endoparasit Kelelawar Sebagai Penyebar/Pool Penyakit Hewan Ke Manusia Di Taman Wisata Alam Batuputih Tangkoko Sulawesi Utara". This research is also funded by the Project Community Service Program with the title "Kemitraan



Masyarakat Kelompok Peternak Desa Batuputih Tangkoko Bitung Propinsi Sulawesi Utara". The authors also thanked the Head of the Taman Batu Putih Resort, Tangkoko, and the Village Head Batuputih Village, Ranowulu Bitung District for the research permit and implementation of the partnership program in the Batuputih community.

21

Conflict of interest

The authors declare that there is no conflict of interest.

References

- [1] Ageng W, Krisna N, Andriana P, 2017. Interaksi Kelelawar Manusia: Potensi Zoonosis Di Indonesia. *Vektora*, 9 (2): 87-100.
- [2] Beena, V., Saikumar, G. 2019. Emerging horizon for bat borne viral zoonoses. *VirusDis.* (July–September 2019) 30(3):321–328 <https://doi.org/10.1007/s13337-019-00548-z>
- [3] Wiethoelter A.K, D. B.-Alcrudob, Kock, S. M. Mor. 2015. Global trends in infectious diseases at the wildlife–livestock interface. | www.pnas.org/cgi/doi/10.1073/pnas.1422741112
- [4] Lengkong, H.J., 2009. Bat diversity in tangkoko-duasudara sanctuary based on position above sea level. *J. Ilmiah Sains*, 9: 218-229.
- [5] Pillai V. S, G. Krishna, M. V. Veetil. 2020. Nipah Virus: Past Outbreaks and Future Containment. *Journal Viruses* 2020, 12, 465; doi:10.3390/v12040465.
- [6] Yang X.L., Y.Z. Zhang, R.D. Jiang, H. Guo., B.L. Ning wang, L.Wang, C. Waruhiu, J.H. Zhou, S.Y. Li, P.Daszak, L.F Wang, Z.L.Shi. 2017. Genetically Diverse Filoviruses in Rousettus and Eonycteris spp. Bats China 2009 and 2015. *Emerging Infectious Diseases*. Vol.23. No.3.
- [7] Mulyono A., Ristiyanto, A. Piyiyanti, A.S. Joharina., D.B.W. Putro, 2018. A New Record on Fruit Bats (*Macroglossus sobrinus*) as a *Leptospirosis* Reservoir From Indonesia. *Vektora* vol 10 No 2 Oktober 2018: 103-110.
- [8] Norberg V.M.L., J. Rayner. 1987. Ecological Morphology and Flight in Bats (Mammalia; Chiroptera): Wing Adaptations, Flight Performance, Foraging Strategy and Echolocation. *Philosophical Transactions of The Royal Society B Biological Sciences*. DOI: 10.1098/rstb.1987.0030
- [9] Openshaw J.J., S. Hegde, H. M. S. Sazzad, S. U. Khan, M. J. Hossain, J. H. Epstein, P. Daszak, E. S. Gurley, S. P. Luby. 2017. Bat Hunting and Bat–Human Interactions in Bangladeshi Villages: Implications for Zoonotic Disease Transmission and Bat Conservation. *Journal Transboundary and Emerging Diseases*. 64 (2017) 1287–1293
- [10] Quinn E.K, P. D Massey, K. C.Witton, B.J Paterson, K. Eastwood, D. N Durrheim. 2014. Understanding human – bat interactions in NSW, Australia: improving risk communication for



- prevention of Australian bat lyssavirus. *BMC Veterinary Research* 10(1):144, DOI: 10.1186/1746-6148-10-144
- [11] Epstein J.H, H.E. Field, S.Luby, J. R.C. Pulliam, P. Daszak. 2006. Nipah Virus: Impact, Origins, and Causes of Emergence. *Curr. Infect. Dis. Rep.* 2006, 8, 59–65.
- [12] Luby, S.P. The pandemic potential of Nipah virus. *Antiviral. Res.* 2013, 100, 38–43.
- [13] Fransisco L., A. Sullivan., J. Goley., S. Martinez., E. Hagan. 2019. Hidup aman berdampingan dengan Kelelawar. Ecohealth Alliance, Metabiota, University of California Davis. Edisi Bahasa Indonesia diterjemahkan oleh Tim Predict Indonesia.
- [14] Van Der Poel W.H.M, P. H.C. Lina, J. A. Kramps. 2006. Public Health Awareness of Emerging Zoonotic Viruses of Bats: A European Perspective. *Vector-Borne And Zoonotic Diseases* Volume 6, Number 4, 2006
- [15] Nurul A.M, M.Shariz, M. Dzulkhairi, R. Shalinawati, I. Ilna. 2018. Knowledge, Attitude and Practice on Bats-Borne Diseases among Village Residents: A Pilot Study. *Med & Health Dec* 2018; 13(2): 48-57. <https://doi.org/10.17576/MH.2018.1302.05>
- [16] Lia H.Y, G.J. Zhua, Y.Zh. Zhang, L.B. Zhang, E. A. Hagana, S. Martineza, A. A. Chmuraa, L. Francisco, H. Tai, M. Miller, P.Daszak, 2020. A qualitative study of zoonotic risk factors among rural communities in southern China. *International Health* 2020; 12: 77–85. <https://doi.org/10.1093/inthealth/ihaa001>

Human interaction with bats in Batu Putih Village Tangkoko North Sulawesi and the zoonosis risk

ORIGINALITY REPORT

19%

SIMILARITY INDEX

18%

INTERNET SOURCES

13%

PUBLICATIONS

%

STUDENT PAPERS

PRIMARY SOURCES

1	www.medicineandhealthukm.com Internet Source	2%
2	www.ausbats.org.au Internet Source	2%
3	onlinelibrary.wiley.com Internet Source	1%
4	link.springer.com Internet Source	1%
5	biodiversitas.mipa.uns.ac.id Internet Source	1%
6	Paula Rogovski, Rafael Dorighello Cadamuro, Doris Sobral Marques Souza, Beatriz Pereira Savi et al. "Animal residues use and application for sustainable agriculture on one health approach", Elsevier BV, 2022 Publication	1%
7	ejournal.litbang.depkes.go.id Internet Source	1%

8	assets.researchsquare.com Internet Source	1 %
9	mafiadoc.com Internet Source	1 %
10	Library.ndsu.edu Internet Source	1 %
11	spotidoc.com Internet Source	1 %
12	thescipub.com Internet Source	1 %
13	doaj.org Internet Source	1 %
14	Fatimawali, B J Kepel, T E Tallei. "Overproduction and Purification of Organomercuric Lyase (MerB) from Mercury-resistant Bacteria Pseudomonas aeruginosa Isolate 4B2", IOP Conference Series: Materials Science and Engineering, 2021 Publication	<1 %
15	library.oapen.org Internet Source	<1 %
16	ip-port.inovasi.lipi.go.id Internet Source	<1 %
17	Repository.Unej.Ac.Id Internet Source	<1 %

18	V. Beena, G. Saikumar. "Emerging horizon for bat borne viral zoonoses", VirusDisease, 2019 Publication	<1 %
19	api.intechopen.com Internet Source	<1 %
20	lppm.unsrat.ac.id Internet Source	<1 %
21	journal.isv.org.ir Internet Source	<1 %
22	res.mdpi.com Internet Source	<1 %
23	isenrem.ipb.ac.id Internet Source	<1 %
24	www.ncbi.nlm.nih.gov Internet Source	<1 %
25	pubmed.ncbi.nlm.nih.gov Internet Source	<1 %
26	covid19commission.org Internet Source	<1 %
27	researchonline.rvc.ac.uk Internet Source	<1 %
28	Kanokwan Suwannarong, Karnsunaphat Balthip, Phitsanuruk Kanthawee, Kangsadal Suwannarong et al. "Bats and belief: A	<1 %

sequential qualitative study in Thailand",
Heliyon, 2020

Publication

29

Paulo Estefano D. Bobrowiec, Leonardo dos Santos Rosa, Janaina Gazarini, Torbjørn Haugaasen. "Phyllostomid Bat Assemblage Structure in Amazonian Flooded and Unflooded Forests", Biotropica, 2014

Publication

<1 %

30

www.mdpi.com

Internet Source

<1 %

Exclude quotes Off

Exclude matches Off

Exclude bibliography Off