World Journal of Agricultural Research, 2013, Vol. 1, No. 3, 44-47
Available online at http://pubs.sciepub.com/wjar/1/3/3

DOI:10.12691/wjar-1-3-3

Ectoparasite Survey of Quarantined Animals in a Wildlife Rescue Center in Quezon City, Philippines

Glenn l. Sia Su[1,*], Christian James A. Amil[1], Jilly Ann P. San Juan[1], Maria Lilibeth L. Sia Su[2], Glenn S. Maguad[3], Rizza A.F. Salinas[3], Elena M. Ragragio[1], Anna Theresa A. Santiago[1], Gliceria B. Ramos[4]

[1]Biology Department, College of Arts and Sciences, University of the Philippines-Manila, Manila, Philippines
[2]College of Medicine, University of the Philippines-Manila, Manila, Philippines
[3]Wildlife Rescue Center, Protected Areas and Wildlife Bureau, Department of Environment and Natural Resources, Quezon City, Philippines
[4]Biology Department, College of Science, De La Salle University, Manila, Philippines
*Corresponding author: glss76@yahoo.com

Received May 1, 2013; Revised May 11, 2013; May June 25, 2013

Abstract The presence of ectoparasites in animals creates a multitude of health risks to both the host animals and to the humans who come in contact with these animals. This study aims to conduct an ectoparasite survey among those quarantined animals in a wildlife rescue center and determine the distribution of the ectoparasites in their hosts. Acetate strip technique and manual extraction methods were employed to collect the ectoparasites from the animals brought in the wildlife rescue center. About 53% of the quarantined animals in the wildlife rescue center were positive for ectoparasitic infestation. A total of 344 ectoparasites were recovered from 51 birds and 6 mammals quarantined in the wildlife rescue center. Of the total ectoparasites, 23 are lice and 321 are mites. The ectoparasites obtained from the survey showed that the isolated ectoparasites belong to 11 different taxa. No statistical significant differences were observed on the Shannon Wiener Diversity Indices across all the 8 weeks of collection ($p > 0.05$).

Keywords: *ectoparasite, parasite, species diversity*

1. Introduction

Ectoparasites are a diverse group of organisms that inhabits the integument of its host and feeds on dead skin cells, tissue fluids, blood, and/or lymph. Ectoparasites are recognized as important vectors of zoonotic diseases playing an important role in the transmission of diseases to animals and humans, especially those that come in contact with the ectoparasite-infested animals.

Ectoparasitism is recognized as an important public health threat affecting both animal and human welfare. The presence of ectoparasites in animals creates a multitude of health risks to both the host animals and to the humans who come in contact with these animals. Studies have presented that ectoparasites may bring about allergic reactions [1], tissue damage, secondary infections [2], and life-threatening illnesses [3].

There is a diverse group of ectoparasites known to infest animals. Previous literatures present that ectoparasites may infest domesticated animals [4], animals confined in parks and natural reserves [5,6,7], and even in wildlife centers [8]. Most previous studies focused on looking into the ectoparasites in animals that are on public displays like those at home, in parks, and in zoos; however, there is a paucity of literature on the ectoparasites in animals that are quarantined, confiscated, rescued, and brought to wildlife rescue centers. This study aims to conduct an ectoparasite survey on those animals that are quarantined, confiscated, rescued, and brought to a wildlife rescue center in Metro Manila, Philippines. Likewise, it aims to determine the distribution of the ectoparasite on the host. The information obtained in this study is vital, as it provides baseline information on the diversity of ectoparasites that affect these animals and the information generated may be used to restrategize measures that will safeguard the animals and the people who come in contact with these infested animals.

2. Methodology

A 22-hectare wildlife rescue center situated at 14°38′58.00″ North and 121°02′4.00″ East was identified as the study site. This wildlife rescue center serves as a temporary shelter for endangered animals that are confiscated and rescued from illegal traders, private owners, and wildlife poachers. The wildlife rescue center also provides a rehabilitation clinic for animals that are on display and are quarantined.

Animals that were confiscated, donated, rescued, and brought to the wildlife rescue center are quarantined over a period of 30 days prior to their release in the wild, especially those animal species that are endemically found in the Philippines. All animals that were quarantined in the wildlife rescue center over a period of 8 weeks were examined for ectoparasites from September to October, 2011. The ectoparasites were collected using two methods: manual ectoparasite collection by combing and removal by forceps and acetate strip examination. Physical and dermatologic examination for ectoparasites and signs of

ectoparasitic infestation were performed on all the animals examined. All the animals' body parts and regions were examined for possible ectoparasite infestation.

The ectoparasites collected manually by the use of combing and forceps and by acetate strip method were examined on all possible body regions of the animal. The birds were examined in the following body regions: dorsal and ventral regions, head, trunk, left and right wings, and tail end. Whereas for the mammals, they were examined in the following body regions: dorsal and ventral regions, head, trunk, eyelids, chin, earlobes, ear fringes, extremities, and in between the digits of the fingers. All ectoparasites recovered through manual extraction were contained in glass vials containing 70% alcohol.

The examination of the collected ectoparasites was made under the use of a dissecting microscope and a compound microscope with a magnification of 1,000×. The examined ectoparasites were sorted and identified based on their morphology. The ectoparasites were identified to family, genera, and species levels, when possible using published taxonomic keys and references [9,10,11]. Drawings on to where the ectoparasites were distributed to their hosts were also made.

The species diversity (H) through the Shannon Wiener Index was calculated using the information on each individual host or each species brought to the wildlife rescue center during the time of survey. The species evenness (H/H_{max}) was also determined. The data were tested using the Kruskal–Wallis test to determine whether significant differences on the animal diversity and abundance over the 8 weeks exist. Statistical analysis was done using the Statistical Package for Social Sciences (SPSS). Significant level was set at $p < 0.05$.

3. Results

There was only the 5-week survey period over the 8-week period that we were able to examine the animals brought in the wildlife rescue center as there were no animals brought in the wildlife rescue center in some week periods of observation. We surveyed a total of 57 animals brought in the wildlife rescue center over the study period. Of the total number of animals brought in the wildlife rescue center, 51 were birds and 6 were mammals. Table 1 shows the listing of animal species surveyed for ectoparasites in the wildlife rescue center over the study period. Most of the animal species that were brought in the wildlife rescue center were birds. The most common bird species was the African lovebird, and the most common mammal species brought in the rescue center was the long-tailed macaque.

Table 1. Animal species surveyed for ectoparasites in the wildlife rescue center

Scientific Names	Common Names	Frequency
Spizaetus philippensis	Philippine hawk eagle	1
Nycticorax caledonicus	Rufous night heron	2
Aratinga solstitialis	Sun conure	3
Ecletus roratus polychloros	Red-sided eclectus parrot	1
Penelopides panini	Tarictic hornbill	1
Goura victoria	Victoria crowned pigeon	1
Casmerodius albus	Common egret	1
Agapornis sp.	African lovebird	19
Spilornis chaeta	Serpent eagle	2
Phapiteron leucotis	White-eared brown dove	1
Gallicolumba luzonica	Bleeding heart pigeon	8
Tyto capensis	Grass owl	1
Acridotheres cristatellus	Crested myna	7
Spizaetus cirrhatus	Changeable hawk eagle	1
Haliastur indus	Brahminy kite	1
Phaenicophaeus cumingi	Scale-feathered malkoha	1
Macaca fascicularis	Long-tailed macaque	4
Paradoxurus hermaphoditus	Palm civet	1
Tarsius syrichta	Philippine Tarsier	1

In all the animals examined, 53% was positive for ectoparasite infestation. Of the total number of animal species examined, about nine bird species and two mammal species were found to be infested with ectoparasites. Among the animal species that were infested, a total of 344 ectoparasites were recovered, of which 23 were lice and 321 were mites. All the lice obtained belonged to the Order Mallophaga. Only the quarantined mammals examined were infested with mites, whereas the quarantined birds were infested with both lice and mites. There were five genera groups of lice identified among the surveyed quarantined animals in the center, whereas the mites recovered belonged to five different genera wherein most of the mites belong to the Family Sarcoptidae.

Lice

The most commonly isolated louse was the *Menacanthus stramineus.* The other lice seen in the quarantined birds in the center were *Goniodes* sp., *Goniocotes* sp., *Menopon gallinae*, and *Lipeurus caponis*. The *Menacanthus stramineus* was commonly observed on the regions of the host that were not densely feathered like the breast, thighs, and around the anus. There were some birds whose left and right wings were infested with *Menacanthus stramineus*. The *Goniodes* sp., on the other hand, was commonly observed in all regions of the host's body, including the host's extremities. The *Goniocotes* sp. was observed mostly in the wings where the down feathers are situated. *Menopon gallinae* was commonly occurring in the thigh, breast feathers, and wings of the birds. *Lipeurus caponis* was commonly observed at the ventral side of the host's primary wing feathers.

Mites

Five genera of mites were recovered from all the quarantined birds and mammals in the rescue center. In the quarantined birds examined, the most common mite was the *Pterolichus* sp. (41.3%), followed by the *Megninia* sp. (25.3%). Both of these mites were generally

found on the surface of the feathers of the quarantined birds. The mites belonging to the genera *Acarus* sp. was found in a single quarantined mammal. The *Bryobia* sp. was found in a single quarantined bird, whereas the mite *Glyciphagus* sp. was present in both the quarantined bird and mammal examined in the rescue center. In the quarantined Philippine hawk eagle, the *Glyciphagus* sp. was present in the head region, whereas in the quarantined Philippine Tarsier, the *Glyciphagus* sp. was present in the extremities of the animal. The distribution of the ectoparasites in relation to their hosts is shown in Figure 1.

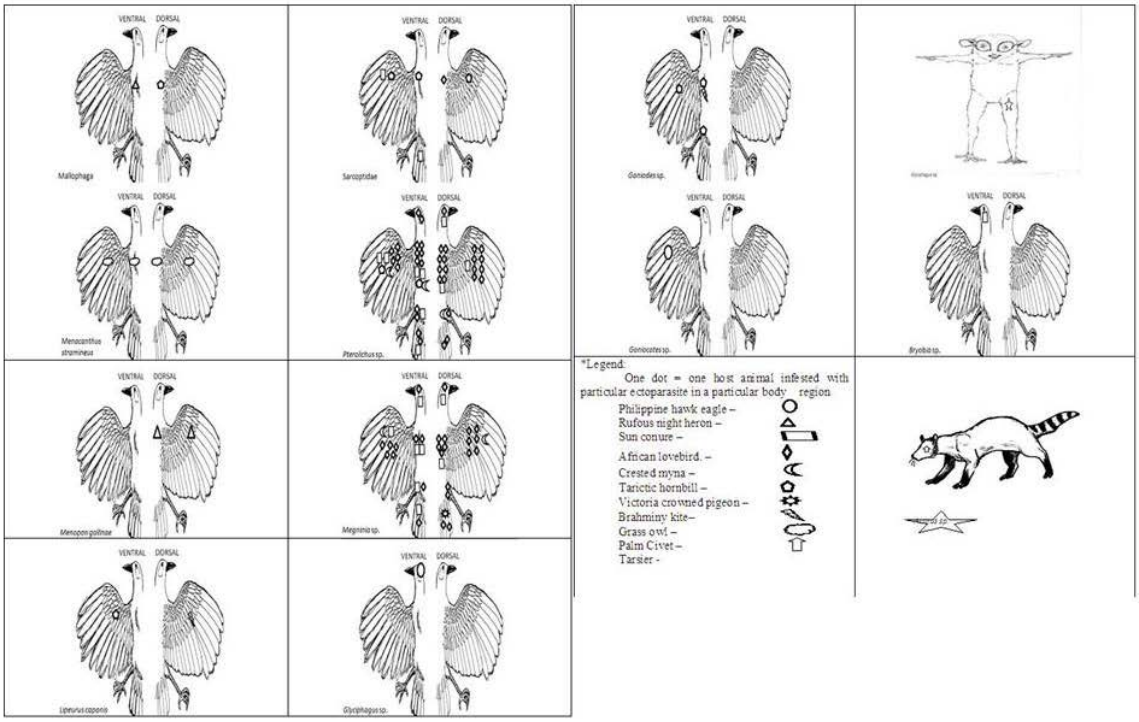

Figure 1. Distribution of ectoparasites on the host species

Of the entire duration of the study, a total of 57 quarantined animals brought in the wildlife rescue center were examined. Table 2 shows the ectoparasite species diversity over the 8-week period. The highest species diversity of 1.355 was recorded in week 1, whereas the highest species evenness of 0.564 was recorded in week 8. The lowest species diversity index and species evenness was recorded in week 3. Despite the variability in the species diversity and evenness of the ectoparasites in the animals over the duration of the study, no significant differences were observed ($p > 0.05$).

Table 2. Ectoparasite species diversity and evenness among the quarantined animals in the Wildlife Rescue Center, Philippines

Period of Examination	Ectoparasite Species	Shannon–Wiener Index (H)	Species Evenness (H/H_{max})
Week 1	124	1.356	0.280
Week 3	194	0.607	0.115
Week 7	20	1.110	0.371
Week 8	6	1.011	0.564

$H_{max} = \ln(S)$.

4. Discussion

The most important result in this study is the documentation of ectoparasite species in the quarantined animals brought in the wildlife rescue center. The information on the presence and the distribution of these ectoparasites in the quarantined animals in the wildlife rescue center is important because it potentially transmits diseases to those who come in contact with these animals [12]. Our study has showed that the most prevalent ectoparasite among the quarantined birds were the lice, followed by the mites, whereas in the two quarantined mammals that were infested, only the mites were observed. Our findings on the prevalence of lice and mites in birds is supported in a previous literature [13] where they likewise observed that, among the raptors that they have examined, the louse was the most prevalent ectoparasite, followed by the feather mites. Previous literature [2] has also indicated that most lice are host-specific organisms. The variations in the occurrence and the distribution of these ectoparasites in the quarantined animals may be because of a number of factors. A study by Viljoen et al. [14] has presented that the occurrence and distribution of ectoparasites may be due to the traits of the host and the environmental factors affecting the exposure and susceptibility of the hosts to these ectoparasites.

5. Conclusion

The result of our study has provided a documentation of ectoparasites that are prevalent in the quarantined animals brought in the wildlife rescue center over the 8-week period of study. The lice and the mites were commonly observed in the quarantined birds, whereas only two mammals included in the study were infested with mites. Despite the variability in the distribution and the occurrence of the ectoparasites on the quarantined animals observed over the 8-week period, no statistical significant differences on the diversity of the ectoparasites were observed.

Statement of Competing Interests

The authors have no competing interests.

References

[1] Haag-Wackernagel, D. and Bircher, A.J, Ectoparasites from feral pigeons affecting humans, *Dermatology*, Vol. 220 No. 1. Pp. 82-92. 2010.

[2] Noaman, V., Chelongar, Y. and Shahmoradi, A.H, The first record of *Argulus foliacesus* (Crustacea: Branchiura) infestation on lionhead goldfish (*Carassius auratus*) in Iran, *Iran Journal of Parasitology*, Vol. 5 No. 2. Pp.71-76. 2010.

[3] Kim, C.-M., Yi, Y.-H., Yu, D.-H., et al. Tick-borne rickettsial pathogens in ticks and small mammals in Korea, *Applied and Environmental Microbiology*, Vol. 72 No. 9. Pp. 5766-5776. 2006.

[4] Natala, A.J., Okubanjo, O.O., Ulayi, B.M., Owolabi, Y.N., Jataui, I.D., and Yusuf, K.H, Ectoparasites of domestic animals in Northern Nigeria, *Journal of Animal and Plant Sciences*, Vol. 3 No. 3. Pp. 238-242. 2009.

[5] Chuulun, M. M, A preliminary survey of ectoparasites of small mammals in Kuala Selangur Nature Park, *Tropical Biomedicine*, Vol. 22. Pp. 243-247. 2005.

[6] Changbunjong, J, Ectoparasitic fauna of birds, and volant and non-volant small mammals captured at Srin Akarin Dam, Kanchanaburi, Thailand, *Southeast Asian Journal of Tropical Medicine and Public Health*, Vol. 41 No. 3. Pp. 526-535.2010.

[7] Mariana, Z.H, A survey of ectoparasites in Gunung Stong Forest Reserve, Kelantan, Malaysia, *Southeast Asian Journal of Tropical Medicine and Public Health*, Vol. 36 No. 5. Pp. 1125-1131. 2005.

[8] Madinah, A., Fatimah, A., Mariana, A., and Abdullah, M.T, Ectoparasites of small mammals in four localities of Wildlife Reserves in Peninsular Malaysia, *Southeast Asian Journal of Tropical Medicine and Public Health*, Vol. 42 No. 4. Pp. 803-813. 2011.

[9] Marshall, A.G, *The ecology of ectoparasitic insects*, Academic Press, London, 1981.

[10] Philips, J.R, Avian mites, *Compendium on Continuing Education for the Practicing Veterinarian*, Vol. 15. Pp. 671-683. 1993.

[11] Durden, L.A., and Musser, G.G, The sucking lice (Insecta, Anoplura) of the world: A taxonomic checklist with records of mammalian hosts and geographical distributions, *Bulletin* of the American Museum of Natural History, Vol. 218. Pp. 1-90. 1994.

[12] Nadchatram, M, The beneficial rain forest ecosystem with environmental effects on zoonoses involving ticks and mites (Acari), a Malaysian perspective and review, *Tropical Biomedicine*, Vol. 25. Pp. 1-92. 2008.

[13] De Oliveira, J.B., Santos, T., Vaughan, C., and Santiago, H, External parasites of raptors (Falconiformes and Strigiformes): Identification in an ex situ population from Mexico, *Revista de Biologia Tropical*, Vol. 59 No. 3. Pp. 1257-1264. 2011.

[14] Viljoen, H., Bennett, N.C., Ueckermann, E.A., and Lutermann, H, The role of host traits, season and group size on parasite burdens in a cooperative mammal, *PLoS ONE*, Vol. 6 No. 11. e27003. 2011.