FACTORS AFFECTING THE BIRD COMMUNITY ON GAYA ISLAND, SABAH, MALAYSIA

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DECLARATION

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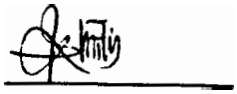

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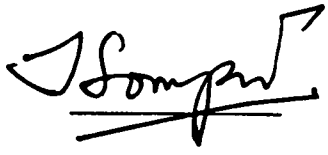

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ABSTRACT

Gaya Island is well known as one of the hot spots for tourist destinations in Sabah. This island harbours both terrestrial and marine wildlife that attracts the tourist in visiting this island. To date, there are only a few studies have been conducted on the impact of the factors influencing the bird community in Gaya Island as the bird act as an important indicator for the health of the island's ecosystem. The purpose of this study is to obtain primary data for Sabah Park to be used as guideline to conserve the bird community in that island in reference to the influencing factor namely the anthropogenic noise and vegetation factors. Hence, this study aims to determine the effect of the influencing factors namely the anthropogenic noise and vegetation on the bird community in Gaya Island. The null hypothesis proposed in this study is that the anthropogenic noise and vegetation does not significantly affect the bird community in Gaya Island. The data collection was conducted for six months in three of the selected sampling sites within the island. The methods that were being used were solely point count sampling, noise measurement and circular plot sampling. Meanwhile, diversity indexes, Spearman's correlation and Mann-Whitney U were used to analyse the obtained data. A total number of 511 individuals from 25 species and 16 families were recorded during the survey. The Shannon_Wiener index showed that the diversity of birds is slightly higher in high anthropogenic noise categories ($H'=2.524$) as compared to the low anthropogenic noise categories ($H'=2.498$) but there was no significant difference of species diversity between two noise categories. Interestingly, according to the result from Mann-Whitney U test, there were eight species of birds showed significant different in terms of abundance at the species level of birds between both types of noise categories ($p<0.05$). In addition, the result of the Spearman's correlation analysis showed that the anthropogenic noise is negatively correlated with the species richness and abundance of birds and it is very significant ($r=-0.054$, $p=0.000$). However, for the tree composition, the result showed that there is no significant correlation between the basal area, stem density and tree diversity with the species richness and abundance of bird in that island. Therefore, the findings from this study showed the anthropogenic noise does play a role in affecting the bird community in Gaya island while there was no statistically significant impact of the basal area, stem density and tree diversity towards the bird community in that island. Nonetheless, further study still needed to be conducted at the other parts of Gaya island in order to get a representative data on the effects of these influencing factors to bird population in that island.

ABSTRAK

FACTORS AFFECTING THE BIRD COMMUNITY ON GAYA ISLAND, SABAH, MALAYSIA

Pulau Gaya sangat terkenal sebagai salah satu destinasi pelancongan di Sabah. Pulau ini mempunyai hidupan liar daratan dan lautan yang menjadi tarikan kepada pelancong untuk datang berkunjung. Namun, hanya terdapat beberapa kajian yang dilakukan berkenaan dengan kesan faktor-faktor yang mempengaruhi komuniti burung di Pulau Gaya kerana burung memainkan peranan sebagai penunjuk bagi kesihatan ekosistem pulau. Tujuan kajian ini dilakukan adalah untuk memperolehi Data primer bagi pihak Taman Sabah untuk digunakan sebagai panduan dalam bagi konservasi komuniti burung dengan merujuk kepada kesan faktor iaitu faktor bunyi anthropogenik dan vegetasi di pulau tersebut. Oleh itu, kajian ini dilakukan bagi menentukan kesan faktor seperti bunyi antropogenik dan vegetasi terhadap komuniti burung di Pulau Gaya. Hipotesis nol yang telah dicadangkan dalam kajian ini adalah bunyi antropogenik dan vegetasi tidak mempunyai kesan yang ketara terhadap komuniti burung di Pulau Gaya. Pengumpulan data telah dilakukan selama enam bulan di tiga kawasan kajian di pulau tersebut. Kaedah yang digunakan adalah "point count sampling", "noise measurement" dan "circular plot sampling". Sementara itu, index kepelbagaian, "Spearman's correlation" dan "Mann-Whitney U test" digunakan untuk menganalisa data yang diperolehi. Sebanyak 511 individu daripada 25 spesis dan 16 keluarga burung yang telah direkod. Index "Shannon_Wiener" menunjukkan nilai kepelbagaian adalah lebih tinggi di kawasan kategori tinggi bunyi antropogenik (H'=2.524) berbanding kawasan kategori rendah bunyi antropogenik (H'=2.498) namun tidak ada perbezaan ketara mengenai kepelbagaian burung di kedua kawasan. Analysis Mann-Whitney U test menunjukkan terdapat lapan spesis burung yang menunujukkan perbezaan ketara dari segi "abundance" pada peringkat spesis burung di kedua-dua jenis kategori bunyi ($p<0.05$). Tambahan pula, keputusan "Spearman's correlation" menunujukkan bunyi antropogenik berkorelasi dengan "species richness" dan "abundance" burung dan ianya sangat ketara ($r=-0.054$, $p=0.000$). Walaubagaimanapun, bagi kompisisi pokok, hasil kajian menunjukkan bahawa tiada korelasi yang ketara diantara "basal area", "stem density" dan "tree diversity" dengan "species richness" dan "abundance" burung di pulau tersebut. Oleh yang demikian, hasil daripada kajian ini menunjukkan bahawa bunyi antropogenik memainkan peranan dalam memberi kesan terdapat komuniti burung di Pulau Gaya. Selain daripada itu, tiada kesan yang ketara secara statistik yang ditunjukkan oleh "basal area", "stem density" dan "tree diversity" terhadap komuniti burung di pulau tersebut. Walaubagaimanapun, kajian susulan masih perlu dilakukan di kawasan lain sekitar Pulau Gaya bagi memperolehi data yang dapat menunujukkan kesan faktor-faktor tersebut terhadap burung secara keseluruhan.

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CHAPTER 1

INTRODUCTION

1.1 Bird Community in an Island Habitat

Islands of which, are smaller in size as compared to the continents have its' own functional ecosystem within the confined areas (Taylor & Kumar, 2016). Apart from that, islands do not only offer beautiful geological landscape but also harbour wildlife such as the birds. The main attraction of the island is the marine tourism (Sompud, *et al.*, 2019) while the bird is not the main tourist attraction in this island as opposed to the birds in Kinabalu National Park. However, bird has become important to the environment as it involves in balancing the ecosystem through its roles such as pollinator, predators and seed disperser (Peh *et al.*, 2005) in the food chains (Basnet *et al.*, 2016). The birds found in islands were also used as the model in the theory of Island Biogeography by MacArthur & Wilson (1967).

The ability of the bird in detecting changes in its' surrounding environment (Yap *et al.*, 2007; Kumar & Shahabuddin, 2006) and forest health (Miller *et al.*, 2004) shows the potential of bird as an effective biodiversity indicator (Sodhi *et al.*, 2005). Therefore, changes of the bird community in an island by looking at the abundance

and species richness due to the surrounding factors such as vegetation as well as the human-made noise will provide beneficial information on the fundamental understanding of the relationship of these factors to bird community of the island. Hence, this information will assist in establishing effective management plan (Yorke, 1984) for the conservation purpose of the bird community in that island.

1.2 Anthropogenic Noise

Anthropogenic noise perceived from the human activities can cause various impacts (Thomsen, 2014) especially towards the wildlife across the universal landscape (Blickley & Patricelli, 2010). The impact of this new emerging factor towards the ecosystem (Forman & Alexander, 1998) in a large scale of the natural environment (Barber *et al.*, 2009) had raised concern towards the wildlife especially those that depends highly on acoustic signal as communication (Evans, 2015). This is because according to Dooling & Popper (2007), this noise can interfere or mask the signal of a sound from being detected by the receiver.

Wildlife particularly the birds use the acoustic communication to conduct their social behaviours such as for defending their territories, attracting their mating partner and sensing the predators (Nemeth *et al.*, 2013; Herrera-Montes & Aide, 2011). Apart from that, the transmission of the acoustic signal also used by the birds for foraging (Curtin & Wilkes, 2005). This shows the importance of their acoustic communication especially in terms of the birds' survival. Therefore, it highlights the needs to focus on understanding the impact of the noise in this study.

1.3 Vegetation Structure

The tropical forest is already well known in supporting more species of birds as compared to the temperate forests (MacArthur & MacArthur, 1961). The vegetation structure of a forest area has been seen in playing significant part as it can influence the species richness of birds such as via the availability of food resources (Hulbert,

2004; Lewis & Starzomski, 2015; Ferger *et al.*, 2014; Cueto & Casenave, 1999; Martin & Blackburn, 2010). Apart from that, forest vegetation also influences the abundance of the bird population (Loiselle & Blake, 1999; Estades & Temple, 1999). This is proven as the species richness of birds that correlate positively with species diversity of trees (Huang *et al.*, 2015) and the total vegetation volume (Fleishman *et al.*, 2003).

According to Santamaría-Rivero *et al.*, (2016), the availability of the food resource in the vegetation structure influence the bird communities. This indicates that the variation in feeding guilds of the birds is also determined by vegetation structure of the forest habitat (Azman *et al.*, 2012; Styring *et al.*, 2011). Furthermore, the vegetation of the forest habitat enables the birds to conduct their social activities such as nesting, foraging and even for protection (DeWalt *et al.*, 2003).

Anderson *et al.*, (1983) state that vegetation factor is an important indicator for measuring the density and diversity of bird. Thus, variation of the vegetation structure will affect the community of the birds (Ramachandran & Ganesh, 2012). Hence, it shows that vegetation is an important predictor of the distribution of birds.

1.4 Problem Statement

Tourism has become one of the important driver for economic growth. To date, construction of more resorts in Gaya Island had recently been proposed by the Sabah Park organization in order to promote the island as a hot tourist destination and increase the island's revenue. Intensive development of the Gaya Island can incur changes toward the biodiversity of the island's ecosystem especially on wildlife. This has been proven through the findings of the preliminary study done by Sompud *et al.*, (2015) whereby there is a negative impact of the development towards bird population through the anthropogenic noise that were being produced.

The influence of the noise on birds is difficult to be fully determined as there is also habitat variables such as the tree composition that can influence the distribution of birds. Nonetheless, there is no published research regarding the spectrum of impact of these factors on bird population in primary forest of Gaya Island. Moreover, lack of reliable information that can serve as a holistic data has caused a great constraint to the Sabah Park organization in terms of decision making in allowing the developers to develop the island as the proposed plan are currently being on hold. In addition, it will also lead in resurfacing of the proposed development project if there is no urgent study being conducted in regards with the impact of these factors on the biodiversity of the island through the chosen indicator that is the bird population.

1.5 Justification

This study plays a crucial part by filling up the gap of obtaining primary data for the Park management that can assist them in decision making about the development project in Gaya Island as this study will provide insight about the range of influence of the anthropogenic noise and tree composition on the distribution of the bird population. Birds are sensitive and highly vulnerable (Lambert & Collar, 2002) towards changes of their environment (Kumar & Shahabuddin, 2006). Moreover, potential indicator will also be able to be determined to provide crucial information especially on the spectrum of impact of the aforementioned factors. Hence, the data from this study can be used as guideline by the Park management to establish a sustainable plan that incorporates the noise management as well as the wildlife management policy that comply with the management plan.

1.6 Objectives

The objectives of this study are:

1. To identify the influence of anthropogenic noise towards the bird community in Gaya Island.

2. To identify the influence on diversity of tree, stem density and basal area towards bird community in Gaya Island.

1.7 Hypothesis

There are two null hypothesis and two alternative hypothesis in this study:

1. H_{null}: The anthropogenic noise does not significantly affect the bird community in Gaya Island.

   $H_{alternative}$: The anthropogenic noise does significantly affect the bird community in Gaya Island.
2. H_{null}: The diversity of tree, stem density and basal area does not significantly affect the bird community in Gaya Island.

   $H_{alternative}$: The diversity of tree, stem density and basal area does significantly affect the bird community in Gaya Island.

1.8 Scope of Study

The research design is illustrated at the Figure 1.1

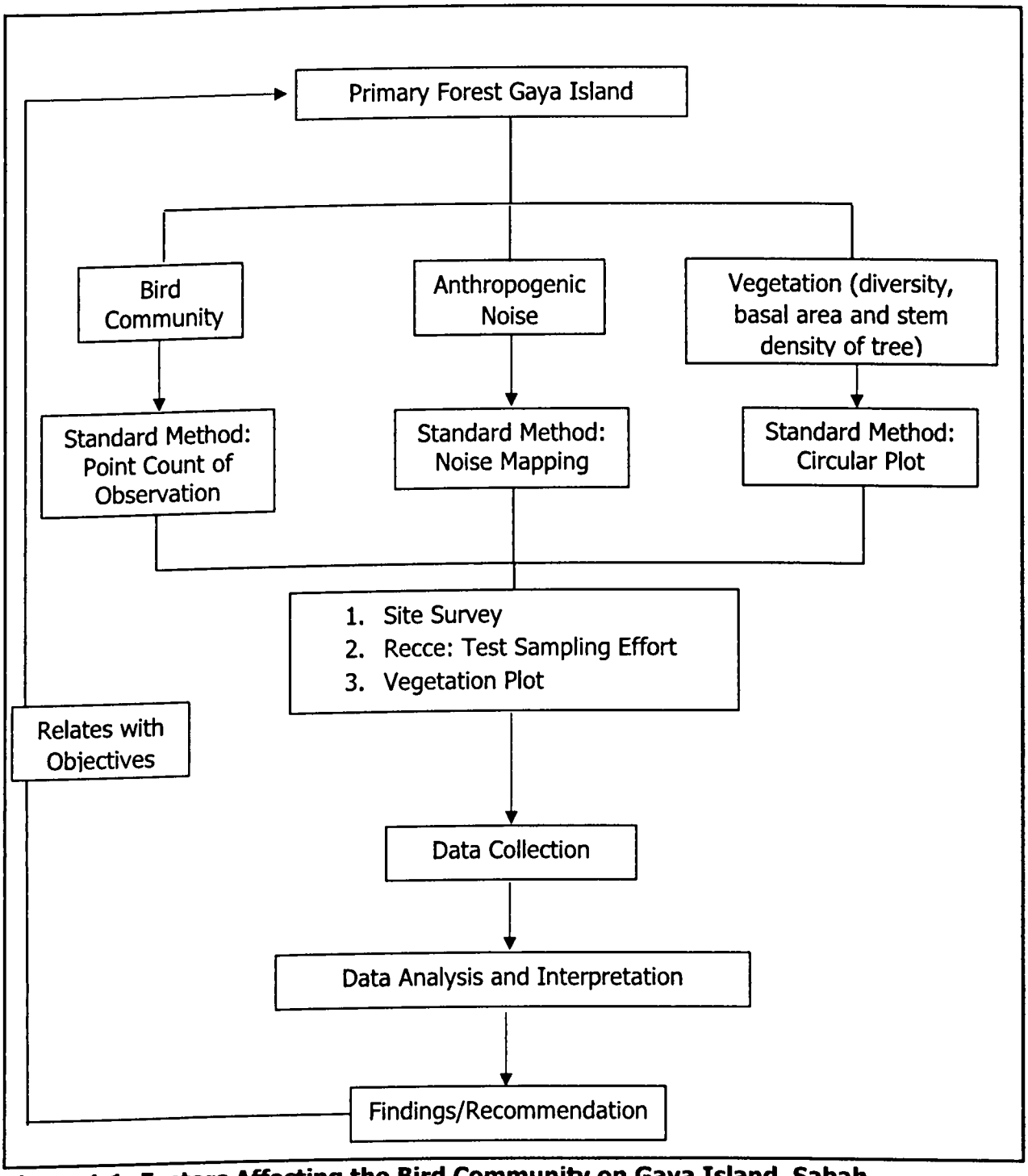

Figure 1.1: Factors Affecting the Bird Community on Gaya Island, Sabah, Malaysia

CHAPTER 2

LITERATURE REVIEW

2.1 Bird Community in Gaya Island

Past studies have shown that islands are crucial site as transit location for birds especially the migratory (David *et al.*, 2016) and also threatened species of birds (Rodrigues & Cunha, 2012). Several past studies about birds have been done in small islands at Peninsular Malaysia such as (Hamza *et al.*, 2018; David *et al.*, 2016; Taib *et al.*, 2019; Ramli *et al.*, 2008). Nonetheless, these studies were only focusing on updating the bird species that were found in the small islands.

In Sabah, Gaya Island is one of hotspot for tourism destination and well known for snorkelling, diving and parasailing activities. As such the main attraction in Gaya Island is the marine sport. Past study done by Stedl & Powell (2006) mentioned that island's tourism activities is one of the sources of anthropogenic noise. The boating activities including bringing in the tourists into the Gaya Island produces anthropogenic noise coming from the sound of the boats' engines. According to Diaz *et al.* (2011), the anthropogenic can affect the birds by masking their acoustic signals. Apart from the anthropogenic noise, the forest vegetation can also affect the birds as the birds depends on the vegetation not only for food resource but also space for perching and nesting (Gandiwa *et al.*, 2013). Nonetheless, there was one published study that was conducted in Gaya Island looking on the impact

the development through the anthropogenic noise on birds was done by Sompud *et al.* (2015). Hence, there is no study that have been done to look on the interaction of the birds with the anthropogenic noise and also vegetation in Gaya Island.

2.2 Effect of Anthropogenic Noise on Birds

To date, the human-made noise such as the noise produced from vehicles and construction activities are known as the anthropogenic noise of which, has become one of the major factors in influencing the wildlife through masking of their acoustic signals (Chan *et al.*, 2010; Luther & Baptista, 2010). Previous studies have also been done that focused on the effect of this anthropogenic noise towards bird population especially at the species level (Arroyo-Solis *et al.*, 2013; Polak, 2014; Kight *et al.*, 2012; Nordt & Klenke, 2013). However, the study of the anthropogenic noise towards the birds is still very limited in Asia especially Malaysia as it is only actively done in Western countries.

Through the review of past studies, species composition, habitat quality (Bayne *et al.*, 2008; Habib *et al.*, 2007) and behaviour (Brumm, 2004) are among the effect of anthropogenic noise that has been found towards the birds. According to Dutilleux (2012), the density of bird population decreases due to anthropogenic noise. Apart from that, the noise also affects the species richness of the avian community (Goodwin & Shriver, 2010). In addition, the high level of anthropogenic noise can result in the reduction of the density of bird population (Bottalico *et al.*, 2015; Dutilleux, 2012). However, this finding is not supported by Wiacek *et al.*, (2015) as their study shows that there is no impact of the train's noise on the bird population and the increase of the diversity of bird population is actually due to the forest edge effect instead. This has indicated that the forest edge effect has outweigh the impact of the noise (Helldin & Seiler, 2003). The impact of noise at the species level are also found in several previous studies conducted by Arroyo-Solis *et al.* (2013); Kight *et al.* (2012); Nordt & Klenke (2013); Hana *et al.* (2011) and Polak (2014) that concentrate on through the selection of certain species of birds.

REFERENCES

Ambrose, A., Sompud, J., Igau, O. A., Repin, R. & Biun, A. 2017. The Preliminary Survey of Bird Population in Kinabalu Park with Different Noise Level. *Transactions on Science and Technology.* 4(2), 109-117.

Anderson, B. W., Ohmart, R. D. & Rice, J. 1983. Avian and Vegetation Community Structure and Their Seasonal Relationships in the Lower Colorado River Valley. *Condor.* 85, 392-405.

Appletants, D., Gentner, T. Q., Hulse, S. H., Balthazart, J. & Ball, G. F. 2005. The Effect of Auditory Distractors on Song Discrimination in Male Canaries (*Serinus canaria*). *Behavioural Processes.* 69, 331–341.

Arevalo, J. E. & Newhard, K. 2011. Traffic Noise Affects Forest Bird Species in A Protected Tropical Forest. *Revista de Biologia Tropical.* 59(2), 969-980.

Arroyo-Solis, A., Castilo, J. M., Lopez-Sanchez, J. L. & Slabbekoorn, H. 2013. Experimental Evidence for An Impact of Anthropogenic Noise on Dawn Chorus Timing in Urban Birds. *Journal of Avian Biology.* 43, 1-9.

Azman, N. M., Latip, N. S. A., Sah, S. A. M., Shafie, N. J. & Khairuddin, N. L. 2011. Avian Diversity and Feeding Guilds in a Secondary Forest, An Oil Palm Plantation and A Paddy Field Riparian Areas of the Kerian River Basin, Perak, Malaysia. *Journal of Tropical Life Science Research.* 22(2), 45-64.

Azpiroz, A. B & Blake, J. G. 2016. Associations of Grassland Birds with Vegetation Structure in the Northern Campos of Uruguay. *The Condor.* 118, 12–23.

Basnet, T. B., Rokaya, M. B., Bhattarai, B. P. & Münzbergová, Z. 2016. Heterogeneous Landscapes on Steep Slopes at Low Altitudes as Hotspots of Bird Diversity in A Hilly Region of Nepal in the Central Himalayas. *PLoS ONE.* 11(3), 1-19.

Barber, J. R., Crooks, K. R. & Fristrup, K. M. 2009. The Costs of Chronic Noise Exposure for Terrestrial Organisms. *Trends in Ecology and Evolution.* 25(3), 180-189.

Bayne, E. M., Habib, L. & Boutin, S. 2008. Impacts of Chronic Anthropogenic Noise from Energy-Sector Activity on Abundance of Songbirds in the Boreal Forest. *Conservation Biology.* 22(5), 1186-1193.

Blickley, L. J. & Patricelli, G. L. 2010. Impact of Anthropogenic Noise on Wildlife: Research Priorities for the Development of Standards and Mitigation. *Journal of International Wildlife Law and Policy.* 13, 274-292.

Bottalico, P., Spoglianti, D., Bertetti, C. A. & Falossi, M. 2015. Effect of Noise Generated by Construction Sites on Birds. *Conference Inter-noise 2015.* 1-7.

Brown, K. 2008. Effect of Tree Species, Number of Trees, Basal Area and Understory Vegetation on the Abundance and Diversity of Avian Species. *Ecology.* 381, 1-12.

Brumm, H. 2004. The Impact of Environmental Noise on Song Amplitude in a Territorial Bird. *Journal of Animal Ecology.* 73, 434-440.

Brumm, H. & Zollinger, S. A. 2011. The Evolution of the Lombard Effect: 100 Years of Psychoacoustic Research. *Behaviour.* 148, 1173-1198.

Buckland, S. T. 2006. Point-Transect Surveys for Songbirds: Robust Methodologies. *The Auk.* 123(2), 345-357.

Buckland, S. T., Marsden, S. J. & Green, R. E. 2008. Estimating Bird Abundance: Making Methods Work. *Bird Conservation International.* 18, 91–108.

Cartwright, L. A., Taylor, D. R., Wilson, D. R. & Chow-Fraser, P. 2013. Urban Noise Affects Song Structure and Daily Patterns of Song Production in Red-winged Blackbirds (*Agelaius phoeniceus*). *Urban Ecosyst.* 1-12.

Cardoso, G. C. & Atwell, J. W. 2011. On the Relation Between Loudness and the Increased Song Frequency of Urban Birds. *Animal Behaviour.* 82, 831-836.

Casas, G., Darski, B., Ferreira, P. M. A., Kindel, A. & Müller, S. C. 2016. Habitat Structure Influences the Diversity, Richness and Composition of Bird Assemblages in Successional Atlantic Rain Forests. *Tropical Conservation Science.* 9(1), 503-524.

Chan, A.A.Y-H., Stahlman, W. D., Garlick, D., Fast, C. D., Blumstein, D. T. & Blaisdell, P. 2010. Increased Amplitude and Duration of Acoustic Stimuli Enhance Distraction. *Animal Behaviour In Press.* 1-5.

Curtin, S. & Wilkes, K. 2005. British Wildlife Tourism Operators: Current Issues and Typologies. *Current Issues in Tourism.* 8(6), 455-478.

Cueto, V. R. & Casenave, J. L. 1999. Determinants of Bird Species Richness: Role of Climate and Vegetation Structure at a Regional Scale. *Journal of Biogeography.* 26, 487–492.

Cynx, J., Lewis, R., Tavel, B. & Tse, H. 1998. Amplitude Regulation of Vocalizations in Noise by a Songbird, *Taeniopygia guttata. Animal Behaviour.* 56, 107–113.

Dalsgaard, B., Carstensen, D. W., Fjeldsa, J., Maruyama, P. K., Rahbek, C., Sandel, B., Sonne, J., Svenning, J-C., Wang, Z & Sutherland, W. J. 2014. Determinants of Bird Species Richness, Endemism, and Island Network Roles in Wallacea and the West Indies: is Geography Sufficient or Does Current and Historical Climate Matter? *Ecology and Evolution.* 20(4), 4019–4031.

Datta, A. & Rawat, G. S. 2008. Dispersal Modes and Spatial Patterns of Tree Species in a Tropical Forest in Arunachal Pradesh, Northeast India. *Tropical Conservation Science.* 1(3), 163-185.

David, G., Roslan, A., Mamat, M. A., Abdullah, M. T. & Hamza, A. A. 2016. A Brief Survey on Birds from Pulau Perhentian Besar, Terengganu. *Journal of Sustainable Science and Management Special Issue Number 1: The International Seminar on the Straits of Malacca and the South China Sea 2016.* 11-18.

Davis, S. K. 2004. Area Sensitivity in Grassland Passerines: Effects of Patch Size, Patch Shape, and Vegetation Structure on Bird Abundance and Occurrence in Southern Saskatchewan. *The Auk.* 121(4), 1130–1145.

DeWalt, S. J., Maliakal, S. K. & Denslow, J. S. 2003. Changes in Vegetation Structure

and Composition Along a Tropical Forest Chronosequence: Implications for Wildlife. *Journal of Forest Ecology and Management.* 182, 139-151.

Diaz, L. 2006. Influences of Forest Type and Forest Structure on Bird Communities in Oak and Pine Woodlands in Spain. *Forest Ecology and Management.* 223, 54–65.

Diaz, M., Parra, A. & Gallardo, C. 2011. Serins Respond to Anthropogenic Noise by Increasing Vocal Activity. *Behavioral Ecology.* 332-336.

Dooling, R. J & Popper, A. N. 2007. *The Effects of Highway Noise on Birds.* Jones and Stokes Associate, California.

Dutilleux, G. 2012. Anthropogenic Outdoor Sound and Wildlife: It's Not Just Bioacoustics! *Conference of Acoustics 2012.* 1-6.

Estades, C. F. & Temple, S. A. 1999. Deciduous-forest Bird Communities in a Fragmented Landscape Dominated by Exotic Pine Plantations. *Ecological Applications.* 9(2), 573-585.

Evans, P, G. H. 2015. Introducing Noise into the Marine Environment–What are the Requirements for an Impact Assessment? P*roceedings of an ECS/ASCOBANS/ACCOBAMS Joint Workshop held at the 28th Annual Conference of the European Cetacean Society, Liège, Belgium.* 58, 2-7.

Ferger, S. W., Schleuning, M., Hemp, A., Howell, K. M., & Böhning-Gaese, K. 2014. Food Resources and Vegetation Structure Mediate Climatic Effects on Species Richness of Birds. *Global Ecology and Biogeography.* 1-24.

Field, A. 2009. *Discovering statistics using SPSS (Third edition).* SAGE Publications ltd, London.

Fleishman, E., Mcdonal, N., Nally, R. M., Murphy, D. D., Walters, J. & Floyd, T. 2003. Effects of Floristics, Physiognomy and Non-Native Vegetation on Riparian Bird Communities in a Mojave Desert Watershed. *Journal of Animal Ecology.* 72, 484-490.

Fontana, C. S., Burger, M. I. & Magnusson, W. E. 2011. Bird diversity in A Subtropical South-American City: Effects of Noise Levels, Arborisation and Human Population Density. *Urban Ecosyst.* 14, 341–360.

Forman, R. T. T. & Alexander, L. E. 1998. Roads and Their Major Ecological Effects. Annual Review of Ecology and Systematics. 29, 207-231.

Forman, R. T. T., Reineking, B. & Hersperger, A. M. 2002. Road Traffic and Nearby Grassland Bird Patterns in A Suburbanizing Landscape. *Environmental Management.* 29, 782–800.

Francis C. D., Ortega, C. P. & Cruz, A. 2010. Vocal Frequency Change Reflects Different Responses to Anthropogenic Noise in Two Suboscine Tyrant Flycatchers. *Proceedings of the Royal Society B: Biological Sciences.* 278, 2025-2031.

Francis, C. D., Ortega, C. P. & Cruz, A. 2011. Different Behavioural Responses to Anthropogenic Noise by Two Closely Related Passerine Birds. *Biology Letters.* 1-3.

Francis, C. D. & Blickley, J. L. 2012. Introduction: Research and Perspectives on the Study of Anthropogenic Noise and Birds. *Ornithological Monographs.* 74, 1-5.

Fuller, R. A., Warren, P. H. & Gaston, K. J. 2007. Daytime Noise Predicts Nocturnal Singing in Urban Robins. *Biology Letters.* 3, 368–370.

Gandiwa, P., Chinoitezvi, E. & Gandiwa, E. 2013. Structure and Composition of Woody Vegetation in Two Important Bird Areas in Southern Zimbabwe. *The Journal of Animal & Plant Sciences.* 23(3), 813-820.

González-Oreja, J. A., Fuente-Díaz-Ordaz, A. A., Hernández-Santín, L., Bonache-Regidor, C. & Buzo-Franco, D. 2012. Can Human Disturbance Promote Nestedness? Songbirds and Noise in Urban Parks as A Case Study. *Landscape and Urban Planning In press.* 1-23.

Goodwin, S. E. & Shriver, W. G. 2010. Effects of Traffic Noise on Occupancy Patterns of Forest Birds. *Conservation Biology.* 25(2), 406-411.

Habib, L., Bayne, E. M. & Boutin, S. 2007. Chronic Industrial Noise Affects Pairing Success and Age Structure of Ovenbirds *Seiurus aurocapilla*. *Journal of Applied Ecology.* 1, 176-184.

Hale, A. M. 1994. Construction of A Circular Plot Sampling Instrument. *Ohio Journal of Science.* 94(4), 113-114.

Hammer, Ø., Harper, D. A. T. & Ryan, P. D. 2001. Past: Paleontological Statistics Software Package for Education and Data Analysis. *Palaeontologia Electronica.* 4(1), 1-9.

Hamza, A., David, G., Mcafee, A., & Tajuddin, M. 2018. Annotated Checklist of Avifauna in Pulau Bidong, Malaysia. *Journal of Sustainability Science and Management.* 13(1), 103-116.

Hana, D., Blouin-Demers, G., Wilson, D. R. & Mennill, D. J. 2011. Anthropogenic Noise Affects Song Structure in Red-Winged Blackbirds (*Agelaius phoeniceus*). *Journal of Experimental Biology.* 214, 3549-3556.

Hauki, J. & Kossowski, T. 2011. Comparison of Value of Pearson's and Spearman's Correlation Coefficients on the Same Sets of Data. *Quaestiones Geographicae.* 30(2), 87-93.

Helldin, J. O. & Seiler, A. 2003. Effects of Road on the Abundance of Birds in Swedish Forest and Farmland. *Habitat Fragmentation due to Transportation Infrasturcture-IENE 2003.* 1-9.

Herrera-Montes, M. I & Aide, T. M. 2011. Impacts of Traffic Noise on Anuran and Bird Communities. *Urban Ecosyst.* 14, 415-427.

Hostetler, M. E. & Main, M. B. 2000. Florida Monitoring Program: Point Count Method to Survey Birds. *Wildlife Ecology and Conservation.*

Huang, Y., Zhao, Y., Li, S. & Gadow, K. 2015. The Effects of Habitat Area, Vegetation Structure and Insect Richness on Breeding Bird Populations in Beijing Urban Parks. *Urban Forestry & Urban Greening.* 14, 1027–1039.

Hulbert, A. H. 2004. Species–Energy Relationships and Habitat Complexity in Bird

Communities. *Ecology Letters.* 7, 714–720.

Ikin, K., Barton, P. S., Stirnemann, I. A., Stein, J. R., Michael, D., Crane, M., Okada, S. & Lindenmayer, D. B. 2014. Multi-Scale Associations between Vegetation Cover and Woodland Bird Communities Across A Large Agricultural Region. *PLoS ONE.* 9(5), 1-12.

James, F. C. & Wamer, N. O. 1982. Relationships between Temperate Forest Bird Communities and Vegetation Structure. *Ecology.* 63(1), 159-171.

Johns, A. D. 1985. Selective Logging and Wildlife Conservation in Tropical Rain-Forest: Problems and Recommendations. *Journal of Biological Conservation.* 31, 355-375.

Kessler, M., Kebler, P. J. A., Gradstein, S. R., Schmull, M. & Pitopang, R. 2005. Tree Diversity in Primary Forest and Different Land Use Systems in Central Sulawesi, Indonesia. *Journal of Biodiversity and Conservation.* 14, 547-560.

Kight, C. R., Saha, M. S. & Swaddle, J. P. 2012. Anthropogenic Noise is Associated with Reductions in the Productivity of Breeding Eastern Bluebirds (*Sialia siali*). *Ecological Applications.* 22(7), 1989-1996.

Kumar, R. & Shahabuddin, G. 2006. Consequences of Rural Biomass Extraction for Bird Communities in an Indian Tropical Dry Forest and the Role of Vegetation Structure. *Conservation and Society.* 4(4), 562–591.

LaGory, K. E., Chang, Y. S., Chun, K. C., Reeves, T., Liebich, R. & Smith, K. 2001. A Study of the Effects of Gas Well Compressor Noise on Breeding Bird Populations of the Rattlesnake Canyon Habitat Management Area, San Juan County, New Mexico. *U.S. Department of Energy Assistant Secretary for Fossil Energy.* 1-101.

Lambert, F. R. & Collar, N. J. 2002. The Future for Sundaic Lowland Forest Birds: Long-Term Effect of Commercial Logging and Fragmentation. *Forktail.* 18, 127-146.

Legnage, T & Slater, P. J. B. 2002. The Effects of Rain on Acoustic Communication: Towny Owls Have Good Reason for Calling Less in Wet Weather. *The Royal Society.* 269, 2121-2125.

Leonard, M. L. & Horn, A. G. 2012. Ambient Noise Increases Missed Detections in Nestling Birds. *Biology Letters.* 8, 530–532.

Lewis, K. P. & Starzomski, B. M. 2015. Bird Communities and Vegetation Associations Across A Treeline Ecotone in the Mealy Mountains, Labrador, which is an Understudied Part of the Boreal Forest. *Canadian Journal of Zoology.* 93, 477–486.

Loiselle B. A. & Blake J. G. 1999. Dispersal of Melastome Seeds by Fruit-Eating Birds of Tropical Forest Understory. *Journal of Ecology.* 80(1), 330-336.

Lowry, H., Lill, A. & Wong, B. B. M. 2012. How Noisy Does A Noisy Miner Have To Be? Amplitude Adjustments of Alarm Calls in An Avian Urban 'Adapter'. *PLoS ONE.* 7(1), 1-5.

Luther, D. & Baptista, L. 2010. Urban Noise and The Cultural Evolution of Bird Songs.

Proceedings of Royal Society B: Biological Sciences. 277, 469-473.

MacArthur, R. H. & MacArthur, J. W. 1961. On Bird Species Diversity. *Ecology.* 42(3), 594-598.

MacArthur, R. H. & Wilson, E. O. 1967. *The Theory of Island Biogeography.* Princeton University Press. Princeton.

Magurran, A. E. 2004. *Measuring Biological Diversity.* Blackwell Publishing, Oxford.

Maleki, K. & Kiviste, A. 2015. Effect of Sample Plot Size and Shape on Estimates of Structural Indices: A Case Study in Mature Silver Birch (*Betula pendula* Roth) Dominating Stand in Jarvselja. *Metsanduslikud Uurimused.* 63, 130-150.

Manabe, K., Sadr, E. I. & Dooling, R. J. 1998. Control of Vocal Intensity in Budgerigars (*Melopsittacus undulatus*): Differential Reinforcement of Vocal Intensity and The Lombard Effect. *Journal of Acoustical Society of America.* 103(2), 1190-1198.

Marsden, S. J., Fielding, A. H., Mead, C. & Hussin, M. Z. 2002. A Technique For Measuring the Density and Complexity of Understorey Vegetation in Tropical Forests. *Journal of Forest Ecology and Management.* 165, 117-123.

Martin, T. E. & Blackburn, G. A. 2010. Impacts of Tropical Forest Disturbance Upon Avifauna on A Small Island with High Endemism: Implications for Conservation. *Conservation and Society.* 8(2), 127-139.

McClure, C. J. W., Ware, H. E., Carlisle, J., Kaltenecker, G. & Barber, J. R. 2013. An Experimental Investigation into The Effects of Traffic Noise on Distributions of Birds: Avoiding the Phantom Road. *Proceedings of The Royal Society.* 280, 1-9.

McGregor, P. K., Horn, A. G., Leonard, M. L. & Thomsen, F. 2013. Anthropogenic Noise and Conservation. *Chapter.* 409-444.

McLaughlin, K. E. & Kunc, H. P. 2013. Experimentally Increased Noise Levels Change Spatial and Singing Behaviour. *Biology Letters.* 9, 1-4.

Meillère, A., Brischoux, F. & Angelier, F. 2015. Impact of Chronic Noise Exposure On Antipredator Behavior: An Experiment in Breeding House Sparrows. *Behavioral Ecology.* 1-9.

Miller, J. R., Dixon, M. D. & Turner, M. G. 2004. Response of Avian Communities in Large-River Floodplains to Environmental Variation at Multiple Scales. *Journal of Ecological Applications.* 14(5), 1394-1410.

Mills, G. S., Dunning, J. B. & Bates, J. M. 1991. The Relationship Between Breeding Bird Density and Vegetation Volume. *The Wilson Bulletin.* 103(3), 468-479.

Muhamad, D., Okubo, S., Miyashita, T., Parikesit, & Takeuchi, K. 2013. Effects of Habitat Type, Vegetation Structure, and Proximity to Forests on Bird Species Richness in A Forest–Agricultural Landscape of West Java, Indonesia. *Agroforestry Systems.* 1-14.

Nana, E. D., Sedlacek, O., Dolezal, J., Dancak, M., Altman, J., Svoboda, M., Majesky,

L. & Horak, D. 2015. Relationship Between Survival Rate of Avian Artificial Nests and Forest Vegetation Structure Along A Tropical Altitudinal Gradient on Mount Cameroon. *Biotropica*. 1-7.

Nemeth, E. & Brumm, H. 2010. Birds and Anthropogenic Noise: Are Urban Songs Adaptive? *The American Naturalist.* 176(4), 465-475.

Nemeth, E., Pieretti, N., Zollinger, S. A., Geberzahn, N., Partecke, J., Miranda, A. C. & Brumm, H. 2013. Bird Song and Anthropogenic Noise: Vocal Constraints May Explain Why Birds Sing Higher-Frequency Songs in Cities. *Proceedings of the Royal Society.* 280, 1-7.

Nordt, A. & Klenke, R. 2013. Sleepless in Town – Drivers of The Temporal Shift in Dawn Song in Urban European Blackbirds. *PLoS ONE.* 8(8), 1-10.

Oden, A. I., Brown, M. B., Burbach, M. E., Brandle, J. R. & Quinn, J. E. 2015. Variation in Avian Vocalizations During the Non-Breeding Season in Response to Traffic Noise. *Ethology*. 121, 472–479.

Parris, K. M. & Schneider, A. 2008. Impacts of Traffic Noise and Traffic Volume On Birds of Roadside Habitats. *Ecology and Society.* 14(1), 1-23.

Patricelli, G. L. & Blickley, J. L. 2006. Avian Communication in Urban Noise: Causes and Consequences of Vocal Adjustment. *Auk*. 123(3), 639-649.

Patterson, M. P. & Best, L. B. 1996. Bird Abundance and Nesting Success in Iowa CRP Fields: The Importance of Vegetation Structure and Composition. *The American Midland Naturalist.* 135(1), 153-167.

Peh, K. S. –H. Jong, J. D., Sodhi, N. S., Lim, S. L. –H. & Yap. C. A. –M. 2005. Lowland Rainforest Avifauna and Human Disturbance: Persistence of Primary Forest Birds in Selectively Logged Forests and Mixed-Rural Habitats of Southern Peninsular Malaysia. *Journal of Biological Conservation.* 123, 489-505.

Peh, K. S. H. Sodhi, N. S., De Jong, J., Sekercioglu, C. H., Yap, C. A. M., & Lim, S. L. H. 2006. Conservation Value of Degraded Habitats for Forest Birds in Southern Peninsular Malaysia. *Diversity and Distributions*. 12(5), 572-581.

Phillips, Q. & Phillips, K. 2011. *Birds of Borneo*. John Beaufoy Publishing, UK.

Polak, M. 2014. Relationship Between Traffic Noise Levels and Song Perch Height in A Common Passerine Bird. *Transportation Research Part D Transport and Environment*. 30, 72-75.

Potvin, D. A., Mulder, R. A. & Parris, K. M. 2014. Silvereyes Decrease Acoustic Frequency but Increase Efficacy of Alarm Calls in Urban Noise. *Animal Behaviour.* 98, 27-33.

Proppe, D. S., Sturdy, C. B. & Clair C. C. 2013. Anthropogenic Noise Decreases Urban Songbird Diversity and May Contribute to Homogenization. *Global Change Biology*. 19, 1075–1084.

Pytte, C. L., Rusch, K. M. & Ficken, M. S. 2003. Regulation of Vocal Amplitude by The

Blue-Throated Hummingbird, *Lampornis clemenciae. Animal Behaviour.* 66, 703–710.

Rabin, L. A., McCowan, B., Hooper, S. L. & Owings, D. H. 2003. Anthropogenic Noise and Its Effect of Animal Communication: An Interference Between Comparative Psychology and Conservation Biology. *International Journal of Comparative Psychology.* 16, 172-196.

Radle, A. L. 2001. The Effect of Noise on Wildlife: A Literature Review. *World Forum for Acoustic Ecology*, University of Oregon.

Rahman, T. R. S. 2006. Effects of Habitat Structure and Adjacent Habitats on Birds In Tropical Rainforest Fragments and Shaded Plantations in The Western Ghats, India. *Biodiversity and Conservation.* 15, 1577–1607.

Rajpar, M. N. & Zakaria, M. 2011. Bird Species Abundance and Their Correlationship With Microclimate and Habitat Variables at Natural Wetland Reserve, Peninsular Malaysia. *International Journal of Zoology.* 1-17.

Ramachandran, V. & Ganesh, T. 2012. Habitat Structure and Its Effects on Bird Assemblages in The Kalakad-Mundanthurai Tiger Reserve (KMTR), India. *Journal of the Bombay Natural History Society.* 109(1 & 2), 87-95.

Ramli, R., Azirun, M. S. & Hashim, R. 2008. Bird Diversity of The Three Islands in The Straits of Malacca. *Malaysia Journal of Science.* 27(3), 129-135.

Reijnen, R., Foppen, R. & Meeuwsen, H. 1996. The Effects of Traffic on The Density of Breeding Birds in Dutch Agricultural Grasslands. *Biological Conservation.* 75, 255-260.

Riebel, K. 2003. The 'Mute' Sex Revisited: Vocal Production and Perception Learning in Female Songbirds. *Advances in the Study of Behaviour.* 33, 49-85.

Rios-Chelen, A. A., Salaberria, C., Barbosa, I., Garcia, C. M. & Gil. D. 2012. The Learning Advantage: Bird Species That Learn Their Song Show A Tighter Adjustment of Song to Noisy Environments Than Those That Do Not Learn. *Journal of Evolutionary Biology.* 25, 2171–2180.

Rodrigues, P. & Cunha, R. T. 2012. Birds as A Tool for Island Habitat Conservation and Management. *American Journal of Environmental Science.* 8(1), 5-10.

Ross, B. D., Marrison, M.L., Hoffman, W., Frederickson, T. S., Sawicki, R. J., Ross, E., Lester, M. B., Beyea, J. & Johnson, B. N. 2001. Bird Relationship to Habitat Characteristics Created by Timber Harvesting in Pennslyvannia. *Journal of Pennsylvannia Academy of Science.* 74 (2/3), 71-84.

Said, H. M. 2008. Planning for Sustainable Tourism in Pulau Gaya, Sabah: Preliminary Assessment of Natural Resources, Community, Culture and Their Implications for Future Tourism Development. *Proceedings of Natural Symposium on Tourism Research.* USM, Penang.

Schroeder, J., Nakagawa, S., Cleasby, I. R. & Burke, T. 2012. Passerine Birds Breeding Under Chronic Noise Experience Reduced Fitness. *PLOS ONE.* 7(6), 1-9.

Schuster, S., Zollinger, S. A., Lesku, J. A. & Brumm, H. 2012. On the Evolution Of

Noise-Dependent Vocal Plasticity in Birds. *Biology Letters*. 1-4.

Seibold, S., Hempel, A., Piehl, S., Bässler, C., Brandl, R., Rosner, S. & Muller, J. 2013. Forest Vegetation Structure Has More Influence on Predation Risk of Artificial Ground Nests Than Human Activities. *Basic and Applied Ecology in Press*. 1-7.

Sidiyasa, K. 2001. *Tree diversity in the rain forest of Kalimantan*. The Tropenbos Foundation. Wageningen, The Netherlands.

Sheldon, F., Styring, A. & Hosner, P. A. 2010. Bird Species Richness in A Bornean Exotic Tree Plantation: A Long-Term Perspective. *Biological Conservation.* 143, 399–407.

Slabbekoorn, H. & Ripmeester, E. A. 2007. Birdsong and Anthropogenic Noise: Implications and Applications for Conservation. *Molecular Ecology*. 1-12.

Slabbekoorn, H. 2012. Measuring Behavioural Changes to Assess Anthropogenic Noise Impact on Singing Birds. *Proceedings of Measuring Behavior 2012*. 158-162.

Slabbekoorn, H., Yeh, P. & Hunt, K. 2007. Sound Transmission and Song Divergence: A Comparison of Urban and Forest Acoustics. *The Condor.* 109, 67-78.

Sodhi, N. S., Lian, P. K., Prawiradilaga, D. M., Darjono., Tinulele, I., Putra, D. D., Han, T. T. 2005. Land Use and Conservation Value for Forest Birds in Central Sulawesi (Indonesia). *Journal of Biological Conservation.* 122, 547-558.

Sompud, J., Oswald, A. I. & Mojiol, A. R. 2015. The Impacts of Development on Avifauna at Gaya Island: A Preliminary Survey. *Sabah Park Nature Journal*. 1-8.

Sompud, J., Kee, S. L., Sompud, C. B., Gilbert, E. & Igau, O. I. 2016. The Correlations between Bird Relative Abundance with the Stem Density in Two Years Old *Acacia mangium* Plantation at Sabah Forest Industries, Sipitang. *Transactions on Science and Technology*. 1-8.

Sompud, J., Ambrose, A. & Repin, R. 2019. The Response of Montane Bird Towards Traffic Noise in Kinabalu Park. *Bird Conservational International Journal in Press*: 1-8.

Sompud, J., Sompud, C. B., Pei, K. J. C., Sun, N. C. M., Repin, R. & Tuh, F. 2019. Sunda Pangolin *Manis javanica* (Mammalia: Pholidota: Manidae) of Gaya Island, Sabah. *Journal of Threatened Taxa*. 11(5), 13552-13556.

Styring, A. R., Ragai, R., Joanes, U., Stuebing, R., Hosner, P. A. & Sheldon, F. H. 2011. Bird Community Assembly in Bornean Industrial Tree Plantations: Effect of Forest Age and Structure. *Journal of Forest Ecology and Management.* 261, 531-544.

Summers, P. D., Cunnington, G. M. & Fahrig, L. 2011. Are The Negative Effects of Roads on Breeding Birds Caused by Traffic Noise? *Journal of Applied Ecology.* 48, 1527–1534.

Swaddle, J. P. & Page, L. C. 2007. High Levels of Environmental Noise Erode Pair

Preferences in Zebra Finches: Implications for Noise Pollution. *Animal Behaviour.* 74, 363-368.

Tassicker, A. L., Kutt, A. S., Vanderduys, E. & Mangru, S. 2006. The Effects of Vegetation Structure on The Birds in A Tropical Savanna Woodland in North-Eastern Australia. *The Rangeland Journal.* 28, 139–152.

Taylor, S. & Kumar, L. 2016. Global Climate Change Impacts on Pacific Islands Terrestrial Biodiversity: A Review. *Tropical Conservation Science.* 9(1), 203-223.

The IUCN Red List of Threatened Species. 2016. Retrieved from http://dx.doi.org/10.2305/IUCN.UK.20163.RLTS.T22715792A94469277.en

Thiollay, J. M. 1992. Influence of Selective Logging on Bird Species Diversity in A Guianan Rain Forest. *Conservation Biology.* 6(1), 47-63.

Thomsen, F. 2014. Introducing Noise into The Marine Environment–What Are The Requirements for An Impact Assessment? *Proceedings of an ECS/ASCOBANS/ACCOBAMS Joint Workshop held at the 28th Annual Conference of the European Cetacean Society, Liège, Belgium.* 58, 33-38.

Torres, A. B. & Lovett, J. C. 2012. Using Basal Area to Estimate Aboveground Carbon Stocks in Forests: La Primavera Biosphere's Reserve, Mexico. *Forestry.* 2012. 1-15.

Triantis, K. A., Nogue´s-Bravo, D., Hortal, J., Borges, P. A. V., Adsersen, H., Fernandez-Palacios, J. M., Arau, M. B. & Whittaker, R. J. Measurements of Area and the (Island) Species-Area Relationship: New Directions for An Old Pattern. *Oikos.* 117, 1555-1559.

Verzijden, M. N., Ripmeester, E. A. P., Ohms, V. R., Snelderwaard, P. & Slabbekoorn, H. 2010. Immediate Spectral Flexibility in Singing Chiffchaffs During Experimental Exposure to Highway Noise. *The Journal of Experimental Biology.* 213, 2575-2581.

Wiacek, J., Polak, M., Filipiuk, M., Kucharczyk, M. & Bohatkiewicz, J. 2015. Do Birds Avoid Railroads as Has Been Found for Roads? *Environmental Management.* 1-10.

Winter, M., Johnson, D. H. & Shaffer, J. A. 2005. Variability in Vegetation Effects On Density and Nesting Success of Grassland Birds. *Journal of Wildlife Management.* 69(1), 185-197.

Yap, C. A-M., Sodhi, N. S. & Peh, K. S.-H. 2007. Phenology of Tropical Birds in Peninsular Malaysia: Effects of Selective Logging and Food Resources. *The Auk.* 124(3), 945-961.

Yorke, C. D. 1984. Avian Community Structure in Two Modified Malaysian Habitats. *Journal of Biological Conservation.* 29, 345-362.