THE INFLUENCE OF TIME OF DAY AND RICE PLANT GROWTH PHASES ON BIRD ASSEMBLAGES IN RICE FIELDS

Frances Mae Tenorio and Maria Eleanor Aurellado

Received: 21.04.2018 / Accepted: 26.07.2018

Abstract: Rice fields are one of the habitats used by both water birds and land birds. There is little to no information regarding bird assemblages found in Philippine rice fields. The study has determined whether bird assemblages found in rice fields varied with period of day and the growth phases of rice crops. Surveys during morning and afternoon were conducted in rice fields with different growth phases (i.e., vegetative, reproductive, ripening, and mixed vegetative and ripening phase). A total of 29 species were found in the area. The results showed that bird assemblages did not differ between time of day but differed according to the phases of rice crops. It was observed that secretive birds such as *Gallinula chloropus* and *Gallirallus philippinicus* were associated with green and harvestable fields which contain reproductive and ripening rice plants for shelter. On the other hand, perching birds such as *Hirundo rustica* and *H. tahitica* associated with fields at the vegetative phase, i.e., newly planted rice due to the abundance of stakes. Granivorous birds such as *Lonchura sp.* also strongly associated with rice fields at the reproductive stage where it can feed; however, *Passer montanus* were mainly found in newly planted and mixed rice fields due to presence of both grains and arthropods.

Keywords: bird assemblages, growth phase, Philippines, rice fields, time of day

Introduction:

Numerous bird species have been documented to occur often in large numbers in rice fields (Elphick 2010). The most common groups of species using rice fields are, not surprisingly, those that are associated with shallow wetlands such as waterfowl, shorebirds, and crane-like birds (Acosta et al. 2010; Elphick 2010). Although species traditionally considered "water birds" are generally most common in rice fields, a wide diversity of other species also use this habitat (Elphick 2004). These include wetland associated "land birds" such as kingfishers, wagtails, warblers, prinias and cisticolas; granivorous birds such as sparrows and munias that feed on spilled rice after harvest; and raptors and owls that are attracted by concentration of small birds and high densities of small mammals (Elphick 2010).

Most of these birds use rice fields for foraging (Eadie et al. 2008; Fujioka et al. 2010; Elphick 2010) where most birds feed on spilled grain and aquatic invertebrates, but a range of other foods are also used (Stafford et

Frances Mae Tenorio and
Maria Eleanor Aurellado:
Institute of Biological Sciences
University of the Philippines
Los Baños College
Laguna 4031, Philippines

e-mail (for all authors): fbtenorio@up.edu.ph

al. 2010). Migrants from temperate regions also greatly influence water bird communities in tropical areas (Acosta et al. 2010). Because rice also undergoes various growth phases, availability of suitable food for some species may also be affected. Use of rice fields tends to be lowest when rice is growing (Pierluissi 2010). Other factors such as time of day could also influence the bird species frequenting rice fields. According to Buden (1992) the detectability of birds is attributed to the time of day, wherein the greatest numbers generally being recorded during early morning, with variation occurring seasonally and among species. However, bird assemblages are generally no longer regarded as stable entities, but rather as fluctuating in response to many factors (Maron et al. 2005). Thus, understanding how bird assemblages might be affected by factors such as time of day and growth phase of rice may lead to insights on the ecological requirements of various bird species. Such information could also be important for the control and management of bird pests in agriculture.

In the Philippines, publications on rice field birds are often in the form of field guides (e.g. Kennedy et al. 2000; Bourdin et al. 2015) but there are limited to no publications on factors that would influence the associations of these bird species. Thus, the objective of the study was to determine the bird assemblages found in rice fields. Specifically, it aimed to identify the bird species present in rice fields and determine whether the bird assemblages differ among time of day and among growth phases of rice. It was hypothesized that more bird species will be seen during the morning and that birds would have specific associations with rice fields at a particular growth phase.

Materials and methods:

Study Area

The birds were surveyed on April 2017 in the experimental rice fields found between Biotech road and Institute of Plant Breeding road, in the University of the Philippines Los Baños. Four sites were chosen based on the growth phase of rice planted: vegetative, reproductive, ripening, and mixed vegetative and ripening rice field. Rice plants under the vegetative phase, hereinafter referred to as newly planted rice field (NR), are those undergoing seedling germination to panicle initiation (Schoenly et al. 1996). Rice plants under reproductive phase, i.e. green rice (GR), are those undergoing panicle initiation to flowering while rice plants under the ripening phase, i.e. harvestable rice (YR), are those undergoing flowering to grain maturity and harvest (Schoenly et al. 1996). Meanwhile the newly planted and harvestable rice mix field (MR) is composed of rice plants under vegetative and ripening phase. Each site was divided into three survey sections which has an area of 1947.92 m^2, 2179.94 m^2, 2470.75 m^2, and 2013.95 m^2 respectively.

Sampling

Samplings were conducted for three days from 7:00 - 10:00 a.m. and 4:00 - 6:00 p.m. Each sampling per survey section lasted for ten minutes with five-minute interval for each section. Birds which transferred between adjacent survey sections within the ten-minute sampling were only counted once. A total of 18 surveys was conducted per rice field. Point surveys were conducted for visible birds while transect surveys were conducted to observe birds inside the rice plots. Both survey types were conducted for five minutes. Birds found throughout the sampling were identified using a field guide (Bourdin et al. 2015). Densities of birds were standardized to number of individuals per 2000 m^2.

Statistical Analysis

All statistical analyses were done using R Studio version 3.3.3 (R Core Team 2017). Multivariate generalized linear model (GLMM) using family “negative binomial” was used to determine whether the bird species composition differed between time of day and among sites (Warton et al. 2011). Offset variable was used to account for the difference in the plot areas sampled. A likelihood ratio test was used to determine the difference between time, site, and their interaction. Multivariate homogeneity of variance was tested before running the multivariate generalized linear model using the *mvabund* package (Wang et al. 2017). Non-metric multidimensional scaling (NMDS) was done to visualize the dissimilarities of the samples between time of day and sites using the *vegan* package (Okasanen et al. 2017). Bray-Curtis was used to calculate dissimilarity from the transformed data using density. BIO-BIO procedure (Clarke and Ainsworth 1993) was done to determine which the subset of species whose dissimilarity matrix is maximally correlated with the dissimilarity matrix of the samples. Homogeneity of multivariate group dispersions among rice field types was analyzed using PERMDISP (Anderson et al. 2006). To compare groups, pairwise comparison test was used.

Results and discussion:

Differences in bird species composition among factors

A total of 29 species of birds were sighted throughout the study from 21 families (Tab. 1, Annexes). Families with the highest mean abundance during the morning were Estrildidae (3.97 individuals/2000 m^2), followed by Passeridae (2.85 individuals/2000 m^2) and Ardeidae (1.62 individuals/2000 m^2). Meanwhile, families with the highest mean abundance in the afternoon were Passeridae (3.71 individuals/2000 m^2) followed by Estrildidae (2.48 individuals/2000 m^2) and Rallidae (1.75 individuals/2000 m^2). As for rice growth phases, the highest mean abundance in newly planted rice fields is from Passeridae (5.48 individuals/2000 m^2) followed by Hirundinidae (3.88 individuals/2000 m^2) and Estrildidae (2.57 individuals/2000 m^2). The highest mean abundance in green rice fields is from Estrilidae (6.93 individuals/2000 m^2) followed by Hirundinidae (1.07 individuals/2000 m^2) and Rallidae (0.97 individuals/2000 m^2). In harvestable rice fields, the highest mean abundance is found in Ardeidae (3.19 individuals/2000 m^2) followed by Rallidae (2.11 individuals/2000 m^2) and Hirundinidae (1.03 individuals/2000 m^2). Finally, in mixed fields, the highest mean abundance is from Passeridae (6.78 individuals/2000 m^2) followed by Estrilidae (2.92 individuals/2000 m^2) and Rallidae (2.63 individuals/2000 m^2).

The likelihood ratio test showed that time of day did not contribute to the differences in bird species composition in the area (Dev = 36.86, p value = 0.166), which is also shown in the NMDS (Fig. 1a). On the other hand, bird assemblages between rice growth phase was greatly significant (Dev = 243.74, p value = 0.001). NMDS for the site shows that there was a dissimilarity between the newly planted rice field (NR) and the mixed newly planted and harvestable rice field (MR) (Fig. 1b). Meanwhile, no interaction between time of day and rice growth phase was found (Dev = 0.0, p value = 0.506).

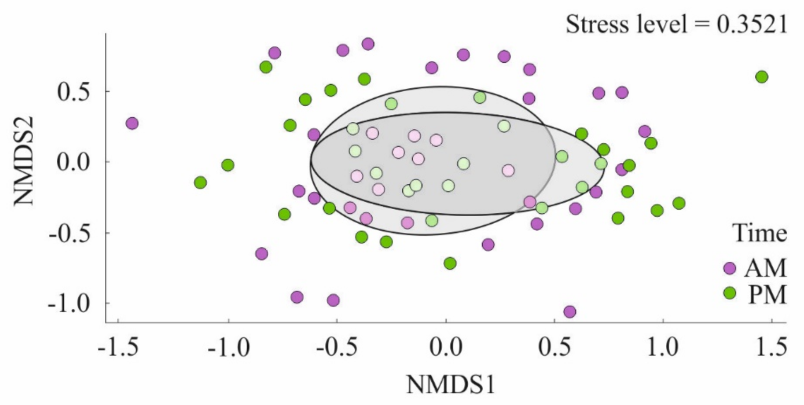
Since the difference between time is not significant, only the differences in the dispersion of birds among sites was analyzed. Based on the results of PERMDISP, there is a significant difference in the dispersion of birds among sites (p value = 0.003). Pairwise comparisons show that multivariate dispersion of samples in newly planted rice field (NR) was different from the other three growth phases. From the NMDS ordination, it appears that multivariate dispersion was smaller in NR than the other growth phases (Fig. 1b).

Association of bird species with different rice fields

Based on the results of the BIO-BIO procedure, the best subset of bird species whose similarity matrix correlate well with the similarity matrix of the samples (rho = 0.957) are *Egretta intermedia, Gallirallus* *philippensis*, *Gallinula chloropus*, *Merops philippinus*, *Hirundo rustica*, *Hirundo tahitica*, *Passer montanus*, *Lonchura atricapilla*, *Lonchura punctulata* and *Motacilla cinerea* (Fig. 2). *E. intermedia* was associated with harvestable rice field (YR). Meanwhile, both *G. philippensis* and *G. chloropus* are associated with mixed rice fields (MR). Birds that are associated with newly planted rice field (NR) and in some mixed fields (MR) include *P. montanus*, *H. rustica* and *H. tahitica* while the those that are associated with green rice field (GR) include *M. philippinus*, *L. atricapilla* and *L. punctulata*.

Figure no. 1 a. Non-metric multidimensional scaling (NMDS) analysis of bird species sighted in the morning (purple dots - AM) and afternoon (green dots - PM); b. Non-metric multidimensional scaling (NMDS) analysis of bird species sighted in newly planted rice field (blue dots - NR), green rice field (red dots - GR), harvestable rice field (green dots - YR) and newly planted and harvestable rice mix field (yellow dots - MR). All plots were based from Bray-Curtis similarity index derived from transformed data using density

a.



b.

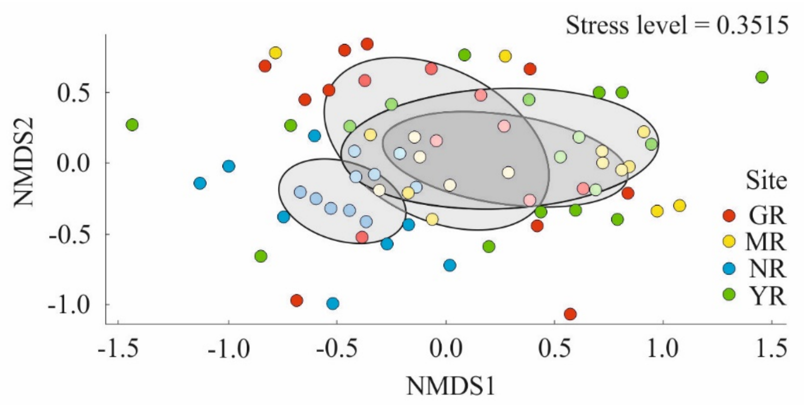
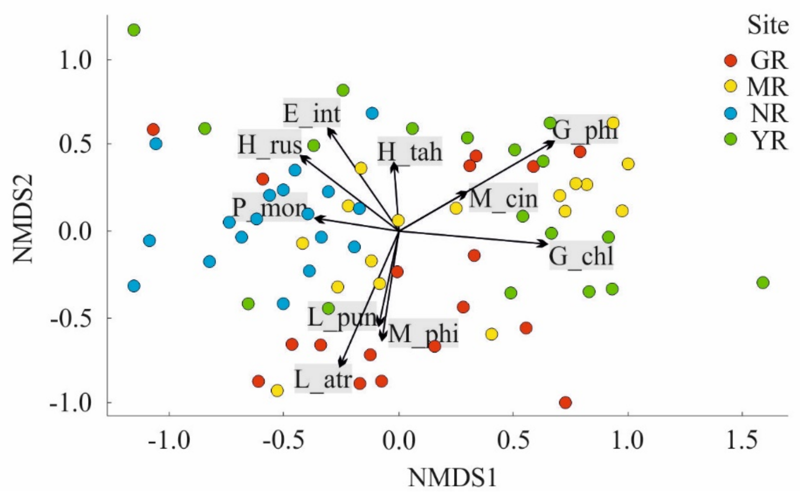


Figure no. 2 Non-metric multidimensional scaling (NMDS) analysis among rice growth phases showing the associated species of birds in each site using BIO-BIO procedure: *Egretta intermedia* (E_inter), *Gallirallus philippensis* (G_phil), *Gallinula chloropus* (G_chloro), *Merops philippinus* (M_phi), *Hirundo rustica* (H_rus), *Hirundo tahitica* (H_tahi), *Passer montanus* (P_mon), *Lonchura atricapilla* (L_atri), *Lonchura punctulata* (L_punc), and *Motacilla cinerea* (M_cin). Rice growth phases are newly planted rice field (blue dots - NR), green rice field (red dots - GR), harvestable rice field (green dots - YR) and newly planted and harvestable rice mix field (yellow dots - MR)



Bird species between time periods

This study showed that species composition of birds did not differ between morning and afternoon, contrary to what was hypothesized. Most studies show that birds are often detected during early mornings due to foraging (Buden 1992). Rice agriculture typically involves seasonal flooding and soil tillage, which provide a variety of microhabitats and potential food for birds including grains and natural plant seeds, invertebrates, vertebrates, and green forage (Stafford et al. 2010). Migratory birds such as shore birds and wading birds often occupy rice fields during non-breeding season (Eadie et al. 2008; Fujioka et al. 2010). Foraging bird use during this season can be intensive (Elphick 2010) causing greater homogeneity in activity along the day, thus increasing the likelihood of detection (Antunes 2008). The time frame used in this study may be a factor in the results. A study conducted by Harms and Dinsmore (2014) found significant difference in detections of marsh birds in response to time of day. They conducted the surveys 30 minutes before sunrise and three hours after sunrise for early morning and three hours before sunset to 30 minutes after sunset for late evening in accordance with the North American Marsh Bird Monitoring Protocol. Unlike Harms and Dinsmore (2014) which conducted the surveys during crepuscular hours, this study was done during daylight hours. All birds surveyed were diurnal, which could explain why no differences in assemblages were found between morning and afternoon. Also, the utilization of call-broadcast survey, which is used to elicit responses and produce higher detection rates, was not part of the study design.

Bird assemblage between sites

This study found that bird assemblages varied among rice fields of different growth phases. Compared to wetlands, rice fields are simple habitats with very low heterogeneity because they are dominated by a single plant species, often have uniform water depths that fluctuate on similar schedules, and experience predictable disturbance factors (Elphick 2010). However, the study area was an experimental rice field, which led to differences between the growth of rice during the sampling. These differences in growth phase would provide a variety of food items and microhabitats that can be used by different bird species.

Passer montanus can be found in newly planted rice fields and mixed rice fields as they tend to feed on the ground for fallen seeds and insects in the stubble (Bourdin et al. 2015). The soil in these areas are highly visible and more accessible compared to green and harvestable rice fields. They were also seen to consume rice grains from intact rice panicles in the mix fields. This species feed on grains and arthropods (particularly insects) to provide their offspring on the first ten days after hatching (Macmillan 1981). Meanwhile, the abundance of *Hirundo rustica* and *H. tahitica* in newly planted and harvestable fields containing rice plants under vegetative and ripening stage may be attributed to their insectivorous diet. Fields with rice plants under vegetative (NR) and reproductive (GR) stages tend to have abundant insects from orders such as dragonflies (Odonata), flies and mosquitos (Diptera), beetles (Coleoptera) and locusts (Orthoptera) (Acosta et al. 2017). In addition, newly planted fields also had numerous stakes where *H. rustica* and *H. tahitica* can rest. The number of stakes in the newly planted rice field ranged from 16 - 48 while in fields with rice plants in harvestable and mixed fields the number of stakes ranged from 0 - 10. These stakes may have provided additional microhabitat for perching birds such as *Hirundo* sp.

Green rice fields containing rice plants under reproductive phase are good sources of food especially for granivorous birds such as *Lonchura atricapilla* and *L. punctulata*. According to Stafford et al. (2010), many birds forage on recently planted rice seeds, seedlings and grains maturing in seed heads before harvest. Observations in the study area have found that granivorous birds either squeeze the grains during the milky phase or eat the entire grain once mature (Bourdin et al. 2015). The presence of the insectivorous *Merops philippinus* in green fields may also be related to the abundance of insects such as dragonflies in those fields (Acosta et al. 2017) and the presence of stakes, which ranged from 4 - 10, where it can perch. Meanwhile, *Egretta intermedia* was seen to retreat in harvestable rice fields as workers occupied the newly planted and green rice fields throughout the study. However, this bird is known to utilize newly-planted rice fields to forage for amphibians, crustaceans, insects and unidentified organisms (Sato and Maruyama 1996). Finally, *Gallirallus philippensis* and *Gallinula chloropus* were found to be associated with harvestable and mixed rice fields, which is consistent with the secretive habits of these resident birds. Secretive birds are a group of species that are often marsh dependent and includes all rails, bitterns, moorhens, and gallinules (Conway 2005). These birds tend to occupy habitats that are densely covered with emergent vegetation (Lor and Maleki 2002), which is characteristic of rice fields at the ripening stage.

The differences in bird species associated with the various rice fields may be attributed to food and microhabitat requirements although other factors could also affect surveys. Because all the sites are experimental fields, human presence is regular. Disturbance due to human presence may have influenced the use of habitats by the birds. For example, it was observed that *Egretta intermedia* occasionally retreats in the harvestable rice fields to avoid humans. This study did not examine how human disturbance can influence the use of different habitats by birds. Activities associated with growing rice such as planting, spraying, and monitoring can induce frequent disturbance. The area is also open to the public and near roads thus, disturbed daily. This study was not designed to test the effects of disturbance in bird assemblages, but the results clearly imply that it is one factor that warrants further attention. Another factor that should also be examined is the seasonal variability since it is possible that timing of migration of migratory species can also affect their presence in various rice fields (Harms and Dinsmore 2014).

Conclusions:

The species composition of bird assemblages found in rice fields varied among different growth phases of rice but not with the time of day. These differences may be attributed to the availability of suitable food and microhabitats present in each of these types of rice fields. Understanding these differences in bird assemblages can help farmers in monitoring bird species considered as pests such as *Passer montanus*, and *Lonchura* spp. which destroy or raid rice fields when they occur in high numbers.

Rezumat:

INFLUENȚA PERIOADEI DIN ZI ȘI A FAZELOR DE CREȘTERE ALE OREZULUI ASUPRA GRUPĂRILOR DE PĂSĂRI DIN CÂMPURILE DE OREZ

Câmpurile de orez sunt unul dintre habitatele folosite atât de păsări de apă, cât și de cele terestre. Există puține informații referitoare la grupările de păsări găsite în câmpurile de orez din Filipine. Studiul a determinat dacă grupările de păsări găsite în câmpurile de orez au variat în funcție de perioada din zi și de fazele de creștere ale culturilor de orez. Au fost efectuate monitorizări în timpul dimineții și după-amiaza în câmpurile de orez cu faze de creștere diferite (de ex. în vegetație, reproductivă, coacere și mixtă între faza vegetativă și de coacere). În zonă au fost semnalate 29 de specii. Rezultatele au arătat că nu există diferențe în gruparea păsărilor în funcție de perioadele zilei, dar există diferențe în ceea ce privește fazele culturilor de orez. S-a observat că păsările cu un comportament mai puțin vizibil, precum *Gallinula chloropus* și *Gallirallus philippinicus*, sunt prezente în câmpuri verzi și recoltabile care conțin plante de orez în faza reproductivă și de coacere, unde se adăpostesc. Pe de altă parte, paseriformele, cum ar fi *Hirundo rustica* și *H. tahitica*, au fost semnalate în câmpurile aflate în faza vegetativă, așa cum sunt plantele nou plantate, datorită abundenței tijelor. Păsările granivore, cum ar fi *Lonchura sp.*, prezintă o mare preferință pentru câmpurile de orez aflate în faza reproductivă, unde se pot hrăni; totuși, *Passer montanus* a fost observat în principal în câmpurile de orez cu plante nou plantate și mixte, ca urmare a prezenței atât a semințelor, cât și a artropodelor.

Acknowledgements:

The researchers would like to thank Kristian James Suetos and Lief Erikson Gamalo for helping in identifying of some bird species found in the area; Dr. Juan Carlos Gonzalez for his insight on bird communities; and Leonardo Estaño and Ren Divien Obeña for their assistance during collection of data.

References:

ACOSTA M., MUGICA L., BLANCO D., LÓPEZ-LANÚS B., ANTUNES DIAS R., DOODNATH L.W., HURTADO J. (2010), Birds of rice fields in the Americas, *Waterbirds 33 (Special Publication 1): 105-122.*

ACOSTA L.G., JAHNKE S.M., REDAELLI L.R., PIRES P.R.S. (2017), Insect diversity in organic rice fields under two management systems of levees vegetation, *Brazilian Journal of Biology 77 (4): 731-744*, DOI: 10.1590/1519-6984.19615.

ANDERSON M.J., ELLINGSEN K.E., MCARDLE B.H. (2006), Multivariate dispersion as a measure of beta diversity, *Ecology Letters 9: 683-693*, DOI:10.1111/j.1461-0248.2006.00926.x.

ANTUNES A.Z. (2008), Diurnal and seasonal variability in bird counts in a forest fragment in southeastern Brazil, *Revista Brasileira de Zoologia 25 (2): 228-237*, DOI: 10.1590/S0101-81752008000200011.

BOURDIN P., PARIS T., SERRANO F., SMEDLEY R., HETTEL G. (2015), *Guide to the birds of the Philippine rice fields*, Los

Baños (Philippines): International Rice Institute.

BUDEN D. (1992), The Birds of the Exumas, Bahama Islands, *The Wilson Bulletin 104 (4): 674-698*, Retrieved from http://www.jstor.org/stable/4163224.

CLARKE K.R., AINSWORTH M. (1993), A method of linking multivariate community structure to environmental variables, *Mar. Ecol. Prog. Ser. 92: 205-219*.

CONWAY C.J. (2005), *Standardized North American Marsh Bird Monitoring Protocols*, Wildlife Research Report #2005-04, U.S. Geological Survey, Arizona Cooperative Fish and Wildlife Research Unit, Tucson, AZ.

EADIE J.M., ELPHICK C.S., REINECKE K.J., MILLER M.R. (2008), Wildlife values of North American ricelands, In: *Conservation in Ricelands of North America* (S.W. Manley, Ed.), pp 7-90, The Rice Foundation, Stuttgart, Arkansas.

ELPHICK C.S. (2004), Assessing conservation trade-offs: Identifying the effects of flooding rice fields for waterbirds on non-target bird species, *Biological Conservation 117: 105-110*.

ELPHICK C.S. (2010), Why study birds in rice fields?, *Waterbirds 33 (Special Publication 1): 1-7*.

FUJIOKA M., LEE S.D., KURECHI M., YOSHIDA H. (2010), Bird use of rice fields in Korea and Japan, *Waterbirds 33 (Special Publication 1): 8-29*.

HARMS T.M, DINSMORE S.J. (2014), Influence of season and time of day on marsh bird detections, *The Wilson Journal of Ornithology 126 (1): 30-38*.

KENNEDY R.S., GONZALES C.P., DICKINSON E., MIRANDA C.H. Jr., FISHER H.T. (2000), *A guide to the birds of the Philippines*, Oxford: Oxford University Press.

LOR S., MALECKI R. (2002), Call-response surveys to monitor marsh bird population trends, *Wildlife Society Bulletin 30:1195-1201*.

MARON M., LILL A., WATSON D.M., MAC NALLY R. (2005), Temporal variation in bird assemblages: How representative is a one-year snapshot?, *Austral Ecology 30: 383-394*.

MACMILLAN B.W.H. (1981), Food of house sparrows and greenfinches in a mixed farming district, Hawke's Bay, New Zealand, *New Zealand Journal of Zoology 8 (1): 93-104*, DOI: 10.1080/03014223.1981.10427946.

OKASANEN J., GUILLAUME BLANCHET F., FRIENDLY M., KINDT R., LEGENDRE P., MCGLINN D., MINCHIN P.R., O'HARA R.B., SIMPSON G.L., SOLYMOS P., HENRY M., STEVENS H., SZOECS E., WAGNER H. (2017), *Vegan: Community Ecology Package*, R package version 2.4-3. https://CRAN.R-project.org/package=vegan.

PIERLUISSI S. (2010), Breeding waterbirds in rice fields: a global review, *Waterbirds 33 (Special Publication 1): 123-132*.

R CORE TEAM (2017), *R: A language and environment for statistical computing*, R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

SATO N., MARUYAMA N. (1996), Foraging site preference of intermediate egrets *Egretta intermedia* during the breeding season in the eastern part of the Kanto Plain, Japan, *Journal of the Yamashina Institute for Ornithology 28 (1): 19-34_1*.

SCHOENLY K., COHEN J., HEONG K., LITSINGER J., AQUINO G., BARRION A., ARIDA G. (1996), Food web dynamics of irrigated rice fields at five elevations in Luzon, Philippines, *Bulletin of Entomological Research 86 (4): 451-466*, doi:10.1017/S0007485300035033

STAFFORD J.D., KAMINSKI R.M., REINECKE J.K. (2010), Avian foods, foraging and habitat conservation in world rice fields, *Waterbirds 33 (Special Publication 1): 133-150*.

WANG Y., NAUMANN U., WRIGHT S., EDDELBUETTEL D., WARTON D. (2017), *mvabund: Statistical Methods for Analysing Multivariate Abundance Data*, R package version 3.12.3. https://CRAN.R-project.org/package=mvabund.

WARTON D.I., WRIGHT S.T., WANG Y. (2011), Distance-based multivariate analyses confound location and dispersion effects, *Methods in Ecology and Evolution 3: 89-101*, doi:10.1111/j.2041-210X.2011.00127.x.

Annexes:

Table no. 1 Birds species found in the experimental rice fields between Biotech and IPB road, University of the Philippines, Los Baños, Laguna

Family / Subfamily	Scientific Name	Common Name
Alcedinidae	*Todiramphus celebensis*	Collared kingfisher
Ardeidae	*Egretta intermedia*	Intermediate egret
	Bubulcus coromandus	Cattle egret
	Egretta garzetta	Little egret
Artamidae	*Artamus leucoryn*	White-breasted wood swallow
Centropodinae	*Centropus bengalensis*	Lesser coucal
Charadriidae	*Charadrius dubius*	Little ringed plover
Columbinae	*Geopelia striata*	Zebra dove
Corvidae	*Corvus macrorhynchos*	Large-billed crow
Estrildidae	*Lonchura punctulata*	Scaly-breasted munia
	Lonchura atricapilla	Chestnut munia
	Lonchura oryzivora	Java sparrow
Glareolidae	*Glareola maldivarum*	Oriental pratincole
Hirundinidae	*Hirundo rustica*	Barn swallow
	Hirundo tahitica	Pacific swallow
Laniidae	*Lanius cristatus*	Brown shrike
Laridae	*Chlidonias hybrida*	White-winged tern
Locustellidae	*Megalurus palustris*	Striated grass bird
Meropidae	*Merops philippinus*	Blue-tailed bee eater
Motacillidae	*Motacilla tschutschensis*	Eastern yellow wagtail
	Motacilla cinerea	Gray wagtail
	Anthus rufulus	Paddyfield pipit
Passeridae	*Passer montanus*	Eurasian tree sparrow
Pycnonotidae	*Pycnonotus goiavier*	Yellow vented bulbul
Rallidae	*Gallirallus philippensis*	Buff-banded rail
	Gallinula chloropus	Common moorhen
Scolopacidae	*Tringa nebularia*	Common greenshank
Sylviidae	*Cisticola juncidis*	Fantailed cisticola
Sturnidae	*Acridotheres cristatellus*	Crested myna