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Biodiversity Congress 2018: Impact of anthropogenic disturbance on anurans habitat and species diversity in Silago, southern Leyte, Philippines

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Abstract

Statement of the Problem:
The combinations of natural and anthropogenic factors such as climate, geographic ranges and vegetation types are considered to have a significant influence on species distributions and diversity. The pattern of increase in habitat heterogeneity on the structure and composition of vegetation becomes complex if the niche diversity and species diversity increases. Moreover, several species of forest anurans are correlated with the number and quality of woody debris, litter depth and overstorey canopy closure. The Philippines is one of the few countries in the world that is covered by rain forest. It is also considered as one of the world's mega diverse countries that host a large share of endemic flora and fauna. However, due to the conversion of forests to marginal agriculture, commercial agriculture and timber plantations, these forest resources are disappearing at an alarming rate. Filipino farmers who are poor and lack employment opportunities in the lowland migrate to the upland areas where they cut down secondary forest and practice slash and burn farming. Silago forest is one of the remaining primary forests in the region. However due to rampant and uncontrolled hunting of wildlife and habitat destruction caused by slash-and-burn cultivation or kaingin contributed by residents both within and outside the communities, threat on biodiversity increases (Ceniza et al., 2011). In Barangays Imelda, Katipunan and Catmon, slash-and-burn cultivation is being practiced by the residents. This is their major source of livelihood because many of them do not own land in the alienable and disposable areas. Thus, the current study examines the impact of ecological disturbance to habitat condition (i.e. rainfall, temperature, relative humidity, vegetation structure, litter depth, and woody debris) and anurans species and population due to anthropogenic activity.

Methodology & Theoretical Orientation:
Establishment of plots followed the method of Williams (2004). Anurans collection was done at early morning 6:00-9:00 am and evening at 7:00-10:00 pm. The Visual Encounter Survey was used to search high potential areas throughout the sampling sites. These are on the surface and under rocks, logs, trees, and other debris within each established plot. Herbaceous layer, understory, canopy vegetation were identified (genus level) and counted. Each CWD was rated on its degree of decomposition ranging from 1 (sound, intact, no rot) to 5 (no structural integrity, soft, powdery). Also, litter depth in each quadrat was measured using a meter stick by randomly selecting three points of location per quadrat. Temperature, rainfall and relative humidity were measured using thermometer, improvised rain gauge and psychro-dyne respectively. PROC univariate test for data normality and heterogeneity was done using statistical analysis system version 9.1 (SAS, 2003). PROC GLM was also used to check effect for the anthropogenic disturbance with habitat condition parameters and species richness and diversity. Finally, Duncan Multiple Range Test (DMRT) was employed to test the factors. All data were tested for normality and heterogeneity using PROC Univariate of Statistical Analysis System version 9.1 (SAS, 2003). PROC GLM (general linear model) procedure was initially performed to check for effects of ecological disturbance on microclimatic factors (i.e., temperature, relative humidity, and rainfall), habitat structure (i.e., litter depth and quantity and quality of coarse woody debris), vegetation structure (i.e., herbaceous layer, understorey, and climax strata), and species richness of anurans. The final models for each response variables were analyzed including but those with only significant main factors effect for anurans. Duncan multiple range test (DMRT) and Least square differences (LSD) were carried out to compare means of independent variables with significant variations at $p \leq 0.05$

Findings:
Both the species richness and diversity in the primary forest is significantly ($p \leq 0.05$) different from slash-and-burn cultivation. Frog population increases steadily during natural

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succession, attaining similar characteristics to those from mature forest after regeneration following slash-and-burn cultivation. Meanwhile, when the habitat starts to stabilize its condition (that is conducive to anurans), the frog species starts to increase dramatically. Meanwhile, the total number of species in the primary forest, secondary forest, and slash-and-burn cultivation were S=7, S=4, and S=0, respectively. The result is consistent with the study of Mallari et al. (2013) in Silago forest where they observed a maximum number of anurans species of S=4. Mallari et al. (2013) reported that the number of species is correlated to the degree of disturbance. Furthermore, the density of frogs observed was eight (8) frogs per 100m2 in the primary forest while four (4) frogs per 100m2 in the secondary forest and zero (0) frog in the slash-and-burn cultivation. This supports the study of Sluys et al. (2007) that the density observed in the rainforest in Brazil is four (4) frogs per 100m2. Moreover, it was observed that there were four (4) species of frogs (i.e, Platymantis corrugatus, Occidozyga laevis, Platymantis sp., and Staurois sp) found in primary forest that were not observed in the secondary forest and slash-and-burn cultivation while Hylarana erythaea (an introduced and invasive species) was observed in the secondary forest and was not observed in the other two sites. The study also showed that microclimatic parameters, microhabitat and vegetation structures appear to be the factors influencing habitat condition of anurans which significantly ($p \leq 0.05$) affect anurans species richness and diversity.

Conclusion & Significance:

The results of the study affirm that anthropogenic disturbance alters anurans habitat condition, thereby, affecting its species richness and diversity. It is worth mentioning that there was a considerable reduction ($p \leq 0.05$) of anurans species richness and diversity in the primary forest, secondary forest and slash-and-burn cultivation. Moreover, the study suggests that microclimatic parameters, microhabitat and vegetation structures appear to be the factors influencing habitat condition of anurans which significantly ($p \leq 0.05$) affect anurans species richness and diversity.

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