

Investigation on species diversity of grassland with different degradation degree

NENU x EDUHK Joint-U Ecological Studies in Jilin Province in 2018 | MAO YUJIE | CHEN ZIYU



Introduction

The site is located in the Songnen Plain, which belongs to the ecological research center of NENU. Founded in 1980, the location of ecological research center is in the western part of Jilin province, where is a typical agro-pastoral area in the eastern margin of the Eurasian steppe. The grassland type here is leymus meadow steppe, and other main natural vegetation includes leymus meadow and elm sparse forest. The soil is mostly salinized with a pH value of around 7.5–9.0, mainly including light black calcium soil, meadow soil, and alkaline wind sand soil.

Objective

The investigation and sampling of the vegetation and insect from different degraded grassland aim to help us to know about the common type of vegetation in Jinlin province, identify the common vegetation and insect in the grassland, and comprehend the basic approach of sampling. After the investigation on the diversity of vegetation and insect in the grassland with different degradation degree, we will analysis the potential causes of grassland degradation and put forward some measures for recovery.

Method

Sampling of insect:

Insects sampling will be taken in every experimental sample area. Use “sweeping net” method to estimate the richness and number of species. Sweeping net is a kind of net that might be used to flock insects together by shifting the net back and forward through the chosen plants (“Methods of Collection of Insects”, p.82). In three different degraded level glass land sample areas, a 20m x 20m size of quadrat will be set respectively, otherwise, in each quadrat, we will choose four parallel transect lines, and each transect line should be at least 3–5 m away from the margin. Four transect lines should take the sampling at the same time, sweeping net once for three steps, furthermore, each transect lines will totally sweep ten times. After collecting the insects, put them into the killing jar which is used to kill caught insects rapidly and with lowest harm (Smithers, 1988). When coming back to the laboratory, classify them to the smallest taxonomic unit.

Sampling of vegetation:

We will choose a sample area: the basic principle to choose is that this area should have representative and typical. The quadrat is set in the sample area. The size of a quadrat for herb community usually is 1m x 1m square quadrat and repeat setting 5–10 quadrats. All the quadrats are randomly arranged in the sample area, or in "S" shaped, "N" shaped, along the diagonal order and so on. Afterwards, we will record the number of each specie and the name of each specie.

Result

According to Gaunle (2018), species richness is the number of species. Species evenness in different grassland can be calculated by the following formula: $J = H' / \ln(S)$

S = the number of species

$H' = - [\sum P_i \ln P_i]$. Where, H' = Diversity Index; P_i = is the proportion of each species in the sample; $\ln P_i$ = natural logarithm of this proportion.

Plant in different type of grassland	Richness	Evenness
Undegraded grassland	10	0.53
Moderately degraded grassland	7	0.23
Severely degraded grassland	5	0.23

Insect in different type of grassland	Richness	Evenness
Undegraded grassland	12	0.68
Moderately degraded grassland	13	0.55
Severely degraded grassland	2	0.91

Discussion

Species diversity is a measurement of an ecosystem’s species richness and species evenness (Balun, 2018). If an ecosystem has poor species diversity, it may not function properly or efficiently. A diverse species assemblage also contributes to ecosystem diversity. While richness is the number of species, the value of species evenness can range from zero to one, with zero signifying no evenness and one, a complete evenness (Gaunle, 2018). With a more complete evenness, the community will be more diverse. As the result shown above, as the grassland being degraded gradually, both plant species richness and plant species evenness would decrease. The highest level of plant richness and evenness were recorded in the undegraded grassland, with 10 and 0.53 respectively. In contrast, the severely degraded grassland had a low level in terms of richness and evenness, with 5 and 0.23 respectively. According to Stiles (2017), plant species richness would enhance the community productivity. Another study implies that species evenness would also enhance the community productivity (Mattingly, 2007). The undergraded grassland thus has higher productivity with greater plant species richness and species evenness. This is important for the grazing management. To increase the grassland productivity and the economic return, people can increase the plant species richness and species evenness rather than increase the input of fertilizer. As for the insects, it is obvious that the severely degraded grassland only has two kind of species due to lack of food. Whist as lack of species diversity, the evenness is particularly high.

Conclusion

From the investigation conclusions, we can find that with the degradation degree rising, the species diversities of vegetation and insect are both dropping down. A science writer, Erickson (2012) said in Michigan News: from a recent study of an international research team, the lack of biodiversity will influence the ecosystems as well as climate change, pollution and other main types of environmental pressure. From this we can consider that maybe it is necessary for human being to protect the species

Reference

- Balun, R. (2018, May 2). The Importance of Species Diversity to the Ecosystem. Retrieved from <https://sciencing.com/importance-species-diversity-ecosystem-6508788.html>
- Gaunle, K. (2018, May 2). How to Calculate the Species Evenness. Retrieved from <https://sciencing.com/calculate-species-evenness-2851.html>
- Erickson, J. (2012, May 2). Ecosystem effects of biodiversity loss could rival impacts of climate change, pollution. /Michigan News/. Retrieved from <https://news.umich.edu/ecosystem-effects-of-biodiversity-loss-could-rival-impacts-of-climate-change-pollution/>
- Mattingly, B. W. (2018, May 19). Species evenness and invasion resistance of experimental grassland communities. Retrieved from http://brudviglab.plantbiology.msu.edu/wp-content/uploads/2017/05/Mattingly_et_al_2017_Oikos.pdf
- Smithers, C. N. (Courtenay Neville) (1988). /The handbook of insect collecting: their collection, preparation, preservation and storage/. Angus & Robertson, North Ryde, N.S.W
- /Methods of Collection of Insects/. Retrieved from: http://shodhganga.inflibnet.ac.in/bitstream/10603/163876/9/09_chapter%206.pdf