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Dataset Development of Fruit Types and Seed Dispersal Modes of Plants in Five Communities in Shilin Geopark, Yunnan, China

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Abstract: The sexual propagule sources for vegetation regeneration are characterized by fruit type and seed dispersal mode. These sexual propagule sources play an important role in the control of degraded ecosystems, including ecosystems affected by karst rocky desertification. To study the sexual propagule sources in Shilin Geopark, Yunnan, China, the vascular plant lists from five communities (obtained using the quadrat method from August to September 2003) were investigated. The five communities were zonal forest, secondary forest, shrubland, shrub tussock, and *Pinus yunnanensis* plantation forest. The fruit type of each species was determined based on "Flora of China". The seed dispersal mode of each species was determined based on the published literature, the Kew Seed Information Database (http://data.kew.org/sid/), and the fruit and seed morphological traits. In total, 16 fruit types (including spore) were observed for the 282 vascular plant species in the communities in Shilin Geopark. Achenes (17.02%), capsules (16.67%), berries (14.18%), and drupes (12.41%) were the most common fruit types. The dominant seed dispersal modes were zoochory (47.87%) and anemochory (33.69%). The dataset consists of two parts: (1) basic information on the five communities (.xlsx, .kmz); (2) data on fruit type and seed dispersal mode of the five different plant communities (.xlsx). The dataset is archived in .kmz and .xlsx data formats, with a size of 45.1 KB (compressed into two files, 41.3 KB). A study based on this dataset was published in the *Chinese Journal of Plant Ecology* (Vol. 42, No. 6, 2018).

Keywords: karst vegetation; vegetation restoration; propagule source; fruit type spectrum; seed dispersal mode; control of karst; Chinese Journal of Plant Ecology

1 Introduction

The propagule sources of plants directly affect the rate and achievement of ecosystem restoration and the function of the restored community[1–2]. Plant propagule sources include the residues (asexual) and seeds (sexual) of plants. Plant residues are not widely dispersible, and

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the number of individual plants and species are limited in environments with severe and repeated disturbance. Therefore, new propagule sources are needed in these communities. Seeds, which can be transmitted by biotic or abiotic factors, can enter a degraded plant community to form a new community[3]. The present vegetative species composition is the result of the interaction between seed dispersal modes and the habitats[4]. Therefore, research on the fruit type and seed dispersal mode spectra of different communities not only reveals the formation history of the communities, but also provides a basis for species selection and the overall selection strategy in vegetation restoration projects.

The control of karst rocky desertification is an important task to ensure restoration of degraded vegetation. The mosaic pattern involving the various communities formed by restoration is ideal for studying community fruit type and seed dispersal spectra. There have been studies on the restoration of degraded karst ecosystems in terms of the propagule types, sources, and mechanisms[2, 5–10], but more research is needed to reveal the sexual propagule sources. Based on the mosaic vegetation pattern of Shilin Geopark, Yunnan, China, which has undergone nearly 40 years of restoration, the following five typical communities were chosen to study the community fruit type and seed dispersal spectra: zonal forest, secondary forest, shrubland and shrub tussock (involving increasing degree of community degradation) and *Pinus yunnanensis* plantation forest (artificial restoration).

2 Metadata of Dataset

The metadata of the "Dataset of fruit types and seed dispersal modes of plants in five communities in Shilin Geopark, Yunnan, China"[11] are summarized in Table 1, including the dataset full name, short name, authors, geographical region, year, data format, data size, data files, data publisher, data sharing policy, etc.

Table 1 Metadata summary of the "Dataset of fruit types and seed dispersal modes of plants in five communities in Shilin Geopark, Yunnan, China"

Items	Description
Dataset full name	Dataset of fruit types and seed dispersal modes of plants in five communities in Shilin Geopark, Yunnan, China
Dataset short name	KarstVegetation_Shilin
Authors	Yu X. Y. F-6250-2014, School of Tourism and Resource Environment, Qiannan Normal University for Nationalities, ynyxy800305@163.com Li Y. H. Q-1730-2019, School of Tourism and Geography Science, Yunnan Normal University, lyh123zhang@163.com
Geographical region	Yunnan Shilin Geopark (24º30′N–25º03′N, 103º10′E–104º40′E), southwest of China
Year	2003 Data format xlsx, .kmz Data size 45.1 KB
Data files	Two spreadsheet in .xlsx format of the fruit type and seed dispersal of vascular plants; A .kmz format of investigation sites
Foundation	National Natural Science Foundation of China (41371514)
Data publisher	Global Change Research Data Publishing & Repository, http://www.geodoi.ac.cn
Address	No. 11A, Datun Road, Chaoyang District, Beijing 100101, China
Data sharing policy	***Data*** from the Global Change Research Data Publishing & Repository includes metadata, datasets (data products), and publications (in this case, in the *Journal of Global Change Data & Discovery*). ***Data*** sharing policy includes: (1) ***Data*** are openly available and can be free downloaded via the Internet; (2) End users are encouraged to use ***Data*** subject to citation; (3) Users, who are by definition also value-added service providers, are welcome to redistribute ***Data*** subject to written permission from the GCdataPR Editorial Office and the issuance of a ***Data*** redistribution license, and; (4) If ***Data*** are used to compile new datasets, the 'ten percent principal' should be followed such that ***Data*** records utilized should not surpass 10% of the new dataset contents, while sources should be clearly noted in suitable places in the new dataset[12]

3 Methods

3.1 Data Collection and Processing

Although a previous study of the plants in the karren habitats of Shilin Geopark described the asexual propagule sources on a small scale[2], research on the propagule sources involved in vegetation restoration in Shilin Geopark needs to be deepened. Regarding the propagule sources, the fruit type and seed dispersal mode spectra of the different communities have a profound impact. Based on the lists of vascular plants in five communities that were investigated using the quadrat method from August to September 2003, the fruit type and seed dispersal mode spectra of the communities were analyzed. The species were identified by research fellow Liu Lunhui of Xishuangbanna Tropical Botanical Garden. The community type and geographical information was recorded.

(1) Growth forms

According to the descriptions of species in "*Flora Reipublicae Popularis Sinicae*"[13], "Flora of China"[14] and , the vascular plants on the five lists were divided into three growth forms, i.e., woody plant, herb, and liana.

(2) Fruit types

With reference to the fruit type system developed by Spjut[15], we determined fruit type according to the fruit morphological traits described in "Flora of China"[14]. As the five lists contained ferns, spore was regarded as a type of fruit for the statistical analysis. The fruit types of the seed plants included achene, capsule, berry, drupe, caryopsis, nut, legume, follicle, pome, strobilus, schizocarp, utricle, samara, hesperidium, and pod.

(3) Seed dispersal modes

The seed dispersal modes of the plants were determined according to the published literature[16–17] and the Kew Seed Information Database (http://data.kew.org/sid/). For the species not included in the literature or the database, the seed dispersal modes were determined based on the fruit and seed morphological traits, the genus which the species belongs to, and the dispersal mechanism.

3.2 Dataset Development Process

The dataset development process is shown in Figure 1.

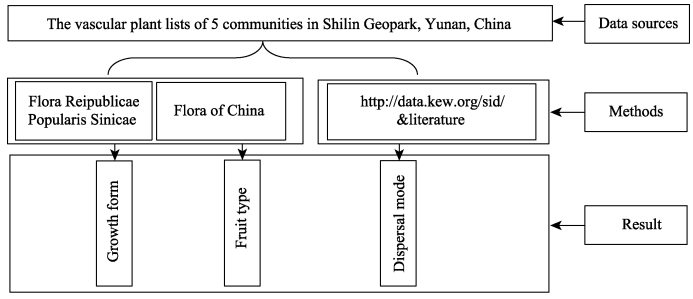

Figure 1 Development process of the "Dataset of fruit types and seed dispersal modes of plants in five communities in Shilin Geopark, Yunnan, China"

4 Results and Validation

4.1 Data Composition

The dataset contains two parts: (1) Data on the species in the five communities, growth form, fruit type, and seed dispersal mode, which were recorded under the following items: Species name, Family, and Genus. The latitude, longitude, altitude, and dominant species in each community was recorded. The data were entered into an Excel table. (2) The maps of the survey sites were saved in .kmz format.

4.2 Data Products

There were 282 species of vascular plant in the five communities, representing 226 genera from 93 families, including 15 fern species. More specifically, in the zonal forest, there were 164 species of vascular plant (representing 133 genera from 71 families, including 11 fern species); in the secondary forest, there were 153 species of vascular plant (representing 127 genera from 66 families, including 8 fern species); in the shrubland, there were 128 species of vascular plant (representing 106 genera from 49 families, including 5 fern species); in the shrub tussock, there were 110 species of vascular plant (representing 92 genera from 47 families, including 5 fern species); and in the *P. yunnanensis* plantation forest, there were 97 species of vascular plant (representing 86 genera from 38 families, including 4 fern species).

The dataset includes details of the growth form spectrum (Figure 2), fruit type spectrum (Figure 3), and seed dispersal mode spectrum (Figure 4) of the 282 vascular plants in the five karst plant communities in Shilin Geopark. The paper that analyzed this dataset was published in the *Chinese Journal of Plant Ecology*[18].

The fruit types of the three growth forms varied between communities. Regarding woody plants, the main fruit type in each community was drupe. The species proportion was 40.98% in zonal forest, 47.06% in secondary forest, 37.25% in shrubland, 37.50% in shrub tussock, and 34.62% in *P. yunnanensis* plantation forest. For woody plants, the top fruit types (i.e., with species proportions >10%) in each community varied. The proportion of berry species was 13.11% in zonal forest. The proportion of capsule species was 13.73% in secondary forest. The proportions of pome and berry species were 13.73% and 11.76% in shrubland, respectively. The proportion of capsule species was 21.88% in shrub tussock. The proportions of capsule, pome, and legume species were 15.38%，15.38% and 15.38% in *P. yunnanensis* plantation forest, respectively.

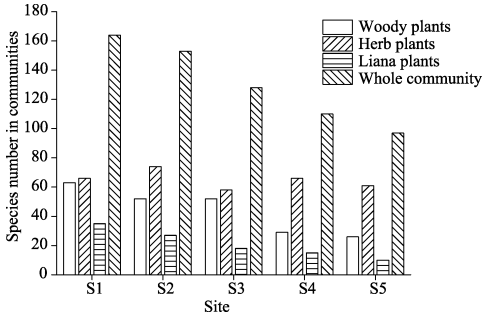

Figure 2 Growth form spectra of the vascular species in five plant communities in Shilin Geopark, Yunnan, China

Note: S1, *Cyclobalanopsis glaucoides* forest; S2, *Neolitsea homilantha* secondary forest; S3, *Cyclobalanopsis glaucoides* shrubland; S4, *Spiraea martini-Heteropogon contortus* shrub tussock; S5, *Pinus yunnanensis* plantation forest.

Regarding herbs, the main fruit type in each community was different, with capsule being the main type in zonal forest (20.90%) and achene being the main type in secondary forest (22.67%), shrubland (29.31%), shrub tussock (31.25%), and *P. yunnanensis* plantation forest (34.43%). For herbs, the top fruit types (i.e., those with species proportions >10%) in each community varied. The proportions of achene, spore, and berry species were 17.91%, 16.42%, and 16.42% in zonal forest, respectively. The proportions of capsule, caryopsis, and spore species were 20.00%, 18.67%, and 10.67% in secondary forest, respectively. The proportions of capsule, caryopsis, and berry species were 20.69%, 17.24%, and 12.07% in shrubland, respectively. The proportions of caryopsis, nut, and capsule species were 25.00%, 12.50%, and 10.94% in shrub tussock, respectively. The proportions of caryopsis and capsule species were 21.31% and 18.03% in *P. yunnanensis* plantation forest, respectively.

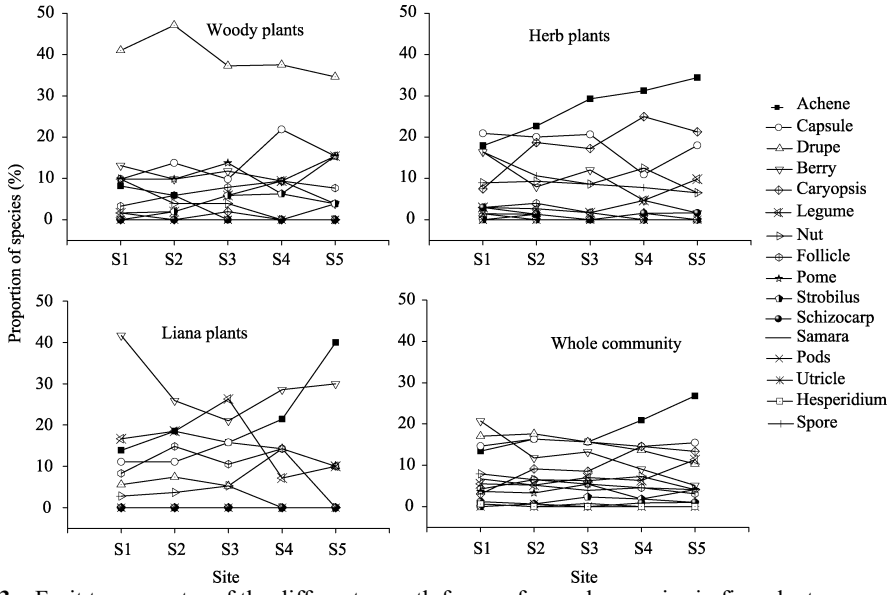

Figure 3 Fruit type spectra of the different growth forms of vascular species in five plant communities in Shilin Geopark, Yunnan, China[18]

Note: S1, *Cyclobalanopsis glaucoides* forest; S2, *Neolitsea homilantha* secondary forest; S3, *Cyclobalanopsis glaucoides* shrubland; S4, *Spiraea martini-Heteropogon contortus* shrub tussock; S5, *Pinus yunnanensis* plantation forest.

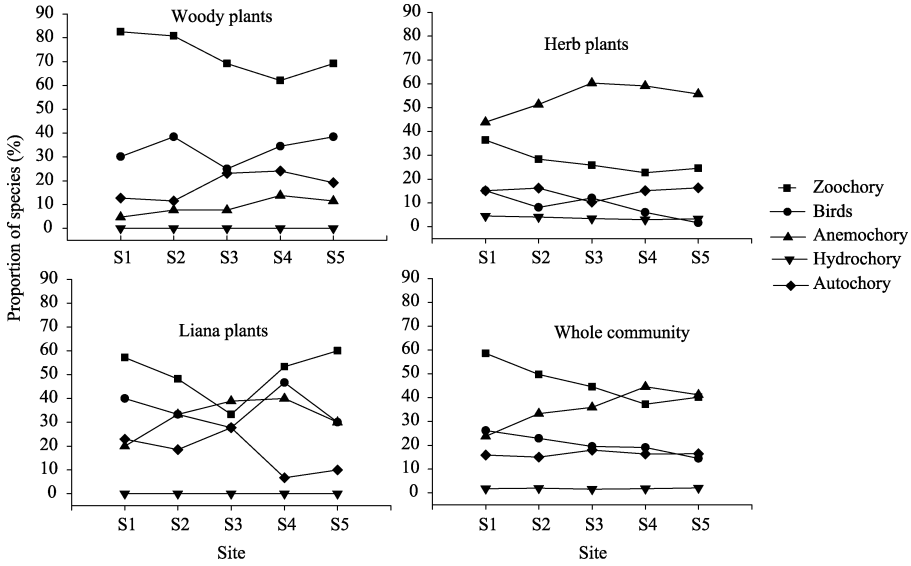

Figure 4 Seed dispersal mode spectra of the different growth forms of vascular species in plant communities in Shilin Geopark, Yunnan, China[18]

Note: S1, *Cyclobalanopsis glaucoides* forest; S2, *Neolitsea homilantha* secondary forest; S3, *Cyclobalanopsis glaucoides* shrubland; S4, *Spiraea martini-Heteropogon contortus* shrub tussock; S5, *Pinus yunnanensis* plantation forest.

Regarding liana, the main fruit type in each community was different. The proportions of berry species were 41.67% in zonal forest, 25.93% in secondary forest, and 28.57% in shrub tussock. The proportion of legume was 26.32% in shrubland. The proportion of achene was 40.00% in *P. yunnanensis* plantation forest. For liana, the top fruit types (i.e., with species proportions >10%) in each community varied. The proportions of legume, achene, and capsule species were 16.67%, 13.89%, and 11.11% in zonal forest, respectively. The proportions of

achene, legume, follicle, and capsule species were 18.52%, 18.52%, 14.81%, and 11.11% in secondary forest, respectively. The proportions of berry, capsule, achene, and follicle species were 21.05%, 15.79%, 15.79%, and 10.53% in shrubland, respectively. The proportions of achene, capsule, drupe, and follicle species were 21.43%, 14.29%, 14.29%, and 14.29% in shrub tussock, respectively. The proportions of berry, drupe, legume, and follicle species were 30.00%, 10.00%, 10.00%, and 10.00% in *P. yunnanensis* plantation forest, respectively.

Regarding the whole community of vascular plants, there was no obvious dominant fruit type in each community, but the top fruit types (i.e., with species proportions >10%) in each community varied. The proportions of berry, drupe, capsule, and achene species were 20.73%, 17.07%, 14.63%, and 13.41% in zonal forest, respectively. The proportions of drupe, achene, capsule, and berry species were 17.65%, 16.34%, 16.34%, and 11.76% in secondary forest, respectively. The proportions of drupe, achene, capsule, and berry species were 15.63%, 15.63%, 15.63%, and 13.28% in shrubland, respectively. The proportions of achene, capsule, caryopsis, and drupe species were 20.91%, 14.55%, 14.55%, and 13.64% in shrub tussock, respectively. The proportions of achene, capsule, caryopsis, legume, and drupe species were 26.80%, 15.46%, 13.40%, 11.34%, and 10.31% in *P. yunnanensis* plantation forest, respectively.

The seed dispersal modes of the different growth forms varied between the five communities. Regarding woody plants, the main seed dispersal mode in each community was zoochory, with a species proportion of 82.54% in zonal forest, 80.77% in secondary forest, 69.23% in shrubland, 52.07% in shrub tussock, and 69.23% in *P. yunnanensis* plantation forest. Autochory was the second most common mode for woody plants in each community, with a species proportion of 12.07% in zonal forest, 11.54% in secondary forest, 23.08% in shrubland, 24.14% in shrub tussock, and 19.23% in *P. yunnanensis* plantation forest.

Regarding herbs, the main seed dispersal mode in each community was anemochory, with a species proportion of 43.94% in zonal forest, 51.35% in secondary forest, 60.34% in shrubland, 89.09% in shrub tussock, and 55.74% in *P. yunnanensis* plantation forest. Zoochory was the second most common mode for herbs in each community, with a species proportion of 36.36% in zonal forest, 28.38% in secondary forest, 25.86% in shrubland, 22.73% in shrub tussock, and 24.59% in *P. yunnanensis* plantation forest. The species proportions of autochory and hydrochory were very small. Regarding liana, the main seed dispersal mode was zoochory in zonal forest (57.14%), secondary forest (48.15%), shrub tussock (53.33%), and *P. yunnanensis* plantation forest (60.00%), but it was anemochory in shrubland (38.89%). The species proportions of autochory and hydrochory were very small. Regarding the whole community of vascular plants, the main seed dispersal mode was zoochory in zonal forest (58.53%), secondary forest (49.67%), and shrubland (44.53%), and the second most common mode in these communities was anemochory. However, in the shrub tussock and *P. yunnanensis* plantation forest, the main seed dispersal mode was anemochory and the second most common mode was zoochory.

4.3 Data Validation

To confirm the reliability of the dataset, the species identification was conducted by Liu Lunhui, a research fellow at Xishuangbanna Tropical Botanical Garden of China. The growth form and fruit type of each species were confirmed by referring to "Flora Reipublicae Popularis Sinicae"[13], "Flora of China"[14], and other plant records (e.g., "Flora Yunnanica"[19]). In addition to referring to the literature[16–17] and the Kew Seed Information Database (http://data.kew.org/sid/).

5 Discussion and Conclusion

On the small scale, some plant residues can be maintained in karren habitats[9]. However, with community degradation or restoration, the species composition profoundly changes, and so the fruit type and seed distribution spectra of communities vary. Due to the complexity of seed dispersal modes, such as secondary dispersal and multiple dispersal modes, careful analysis and observation were required. Therefore, this study, which was based on field investigation data (i.e., plant lists)[14–17] and the Kew Seed Information Database (http://data.kew.org/sid/) to determine the seed dispersal modes. However, a follow-up study is still needed to ensure that the latest progress in botany and seed ecology is taken into account, in order to achieve more accurate determination of the seed dispersal modes.

Author Contributions

Li, Y. H. designed the algorithms of the dataset. Li, Y. H. and Yu, X. Y. contributed to the data processing and analysis. Yu, X. Y. wrote the data paper.

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