NENU X EdUHK Joint-U Ecological Studies in Jilin Province in 2017

Investigation of the Vegetation in the Secondary Forest: Comparison of Changbaishan and Hong Kong

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Introduction

Objectives

- Compare the location and climate differences between Hong Kong and Changbaishan
- How do the location and the climate affect the types of plants and biodiversity
- The relationship between humidity and biodiversity

Definition of Secondary Forest

A secondary forest is a woodland area which has re-grown after a timber harvest until an enough period has passed, and the effects of the disturbance are no longer evident.

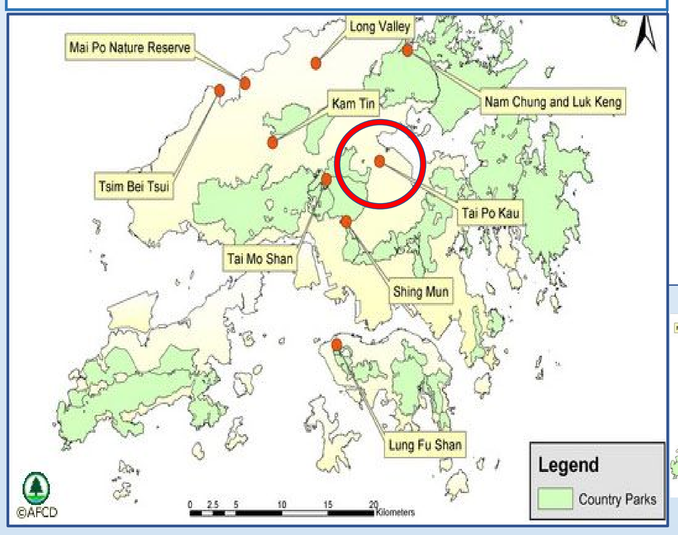
Secondary forests re-establish by the process of succession, it subjects to variety factors. For example, the location of shrubbery, seed sources, nutrients of soil and other external disturbance etc. Typically it takes forty to hundred years for secondary forest to begin resembling the original old-growth forest (CIFOR, n.d.). However, in some cases, a secondary forest will not succeed due to some restriction. Taking Hong Kong as an example, the northern slopes often grow in lush greenery, but for the south one, since it receives abundant sunshine during the dry season, the hillside then resulting in severe mountain fires frequently which affects the forest succession (AFCD, n.d.).

Importance

A secondary forest is vital important because it protects the watershed from further erosion and provides habitat. It also buffers edge effects around mature forest fragments and increases connectivity between them.

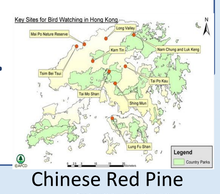
Hong Kong Tai Po Nature Reserve

Hong Kong is on the northern margin of the Asian tropics. The original forest cover was cleared centuries ago but the secondary forest has redeveloped since 1945 at many sites protected from fire and cutting. One of the maturest is Hong Kong Tai Po Kau Nature Reserve (AFCD, n.d.).



Biodiversity - Vegetation
The 460 hectares reserve is heavily wooded with more than 100 different species of trees, and the dominant tree was Chinese Red Pine (AFCD, n.d.).

Fauna-There are many species of insects, birds and animals. In winter you may see owls and wagtails, while in summer there are cuckoos and Black Drongos.

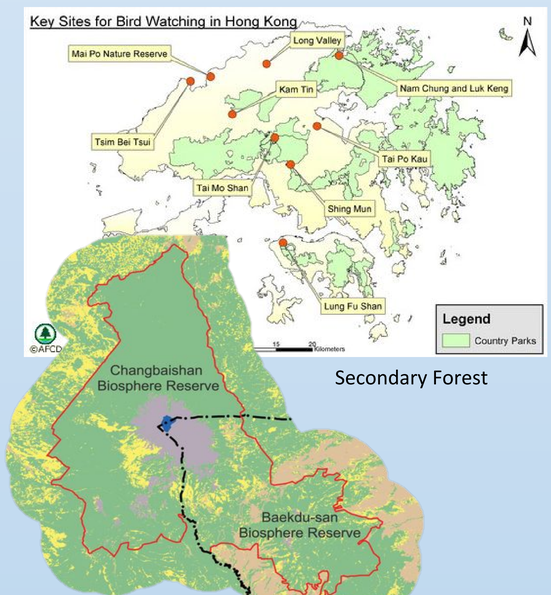


Chinese Red Pine


Black Drongo


wagtail

Changbaishan Nature Reserve



Secondary Forest

The Changbaishan Nature Reserve (CNR) was established in 1960 to protect the virgin mixed Korean pine and broad-leaved forest, which is the typical type of temperate forest in northeastern China. It is located in Jilin Province, northeastern China, where situated on the border between China and North Korea, covers an area of 196,456 hm^2. Due to variations in climatic and topographic conditions, the vegetation within the area changes along altitudinal gradients, covering a deciduous broad-leaved forest zone (below 500 m), a deciduous broad-leaved/conifer mixed forest zone (500–1100 m), a coniferous forest zone (1100–1700 m), a birch forest zone (1700–2100 m) and an alpine tundra zone. This is one of the most intact forests in China, and there are distinctive vertical plant community zones, which is an ideal place to learn the plant biodiversity and vertical distribution pattern of plants.

The Mountain is covered with a large area of undisturbed temperate old-growth forest that is hardly found elsewhere on Earth. Since the turn of the 20th century, parts of the virgin forest has been destroyed by large scale industrial logging by Russian, Japanese and Chinese interests, and then replaced by secondary forests and plantations (CHEN et al., 1994).

Results and Discussion

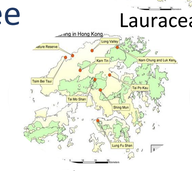
	Changbaishan Secondary Forest (Research on 2017)	Hong Kong Tai Po Kau Nature Reserve) (Research on 2015)	Hong Kong general secondary forests
Location	42.3522°N; 127.9412°E	22°25’4”N; 114° 10’31”E	22°N; 114°E
Terrain(Altitude)	926 m	300m	Highest : 957m
Climate	Temperate	Sub Tropical	Sub Tropical
Temperature	Average: -7°C - 3°C (中國天氣, 2017)	22.9 °C (annual temperature) (Kwok, 2017)	Highest: 35.6°C Lowest: 3.1°C Annual: 26.1°C (HKO, 2016)
Average Humidity (recorded from the conducted period)	33.5 % (recorded from the conducted period) *annual	78.7% (annual average humidity) (Kwok, 2017)	78% (annual average humidity) (HKO, 2015)
Plant Species	42 (NENU, 2017)	77(Within sampling plot in Tai Po Kau Nature Reserve)	77 (Within sampling plot in Tai Po Kau Nature Reserve)
Annual Rainfall	600mm to 900 mm Top of the hill: 1400mm (Tian, et., 2013)	1400 mm to 3000 mm (HKO, 2016)	1400 mm to 3000 mm (HKO,2016)

Comparison of the secondary forest in Hong Kong and Changbaishan

1. Tree types
Lauraceae occupied most of the areas in the forest in Hong Kong
Pinaceae, Betulaceae, Salicaceae are the most common tree types in Changbaishan


Lauraceae


Salicaceae


Pinaceae


Betulaceae

2. Terrain
The highest altitude is 957m in Hong Kong, the altitude of the research in Changbaishan is 926m; Hong Kong’s zonal vegetation is subtropical evergreen broad-leaved forest (管, 2001), it’s different from the forest of coniferous and broad-leaved mixed forest in Changbaishan where we did research.

3. How do the different locations affect the types of plants and biodiversity?
Changbaishan coniferous and broad-leaved mixed forest has a consummate environment which can provide a rich food supplying source and resources supply, it brings up a rich biodiversity there (Li, et.al, 2016).
Hong Kong has high humidity, annual humidity is 78%. Hong Kong has a high biodiversity value due to the location is surrounded by ocean. Hong Kong is near to the Pearl River estuary, the biodiversity is rich since it is affected by freshwater, the salinity of the water is relatively lower. (Green Ser

4. The characteristics of the plants under different climate
Mainly coniferous and broad-leaves in the researching area, those coniferous can prevent losing moisture under the dry climate in Changbaishan (NTHU, n.d.) .

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Ecological Survey on Vegetation in Secondary Forest

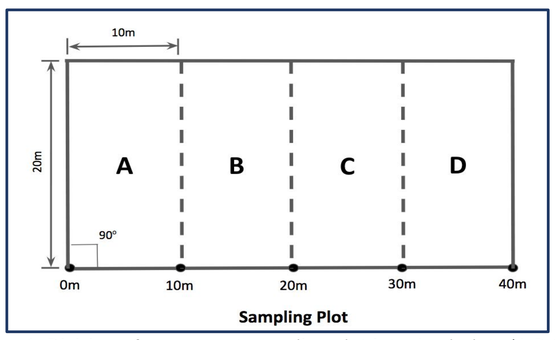

Figure 1: Division of permanent sampling plot into 4 subplots (A,B,C and D)

a. In the secondary forest, located a permanent sampling plot of 20 m x 40 m as field study site. (Fixing rods were placed in every 10 m along the border of the sampling plot)

b. As shown in figure 1, set a transect starting from 10m, 20m and 30m respectively, placing 20 m transect perpendicular (90°) to the fixing rods to subdivide four rectangle sampling plots of 10 m x 20 m each. (Figure 2)

c. Divide into four groups (A,B,C and D), each group responsible for conducting the tree, shrub and herb survey.

(Li et al., 2016)

Figure 2: Setting of transect in in a permanent sampling plot

Materials

Transect 100 m, Quadrat(5 m x 5 m), Quadrat(1 m x 1 m), Altimeter, Fixing Rod, Measuring Tape, Identification Sheet, Data Record Sheet, Counter, Notebook, HB Pencil, Marker.

Figure 3: Measuring the tree trunk diameter at breast height

Figure 4: Recording the data collected in tree survey

1. **Setting Transect in a Permanent Sampling Plot**
2. **Tree Survey**
3. **Shrub Survey**
4. **Herb Survey**

Methodology

a. Measure the trees count in 20 m x 20 m quadrat.
b. Select an individual tree.
i. Observe the structural conditions of tree (i.e. dead trees are not included in the survey).
ii. Measure the trunk diameter in meters at 1.5 m above ground level (DBH) of the tree. (small trees are not included in the survey, i.e. those less than 0.05 m DBH) (figure 3)
iii. Identify the tree species and mark down the reference number for easier tree identification if there are more than one of each species.
iv. Visually estimate the approximate tree height and the highest to lowest branch above ground level.
v. Observe the overall crown spread, measure the approximate width and length of the crown to estimate the canopy area of the individual tree to calculate the coverage of the same tree species in the community. (Figure 4)
c. Repeat procedure 2b until all trees in the quadrat are surveyed.
d. Sort out the survey data obtained, estimate the species richness, relative abundance, basal coverage, density and frequency to obtain the significant values and biodiversity index of each tree species in the community.

(Li et al., 2016)
(West Lindsey District Council, n.d.)

Figure 5: Setting of quadrat for shrub survey

a. Place a 5 m x 5 m quadrat randomly in the sampling plot. (Figure 5)
b. Select an individual shrub.
i. Identify the shrub species and mark down the reference number for easier identification.
ii. Identification if there are more than one of each species.
iii. Observe and record the number of shrub stems at the base, measure the basal diameter in centimeters.
iv. Measure the shrub height in meters.
v. Observe the overall crown spread of the shrub, measure the width and length of the shrubs crown.
c. Repeat procedure 3b until all shrubs in the quadrat are surveyed.
d. Sort out the survey data obtained, estimate the species richness, relative abundance, basal coverage, density and frequency each shrub species in the community.

(Bayley & Brouwer, 2014)
(Li et al., 2016)

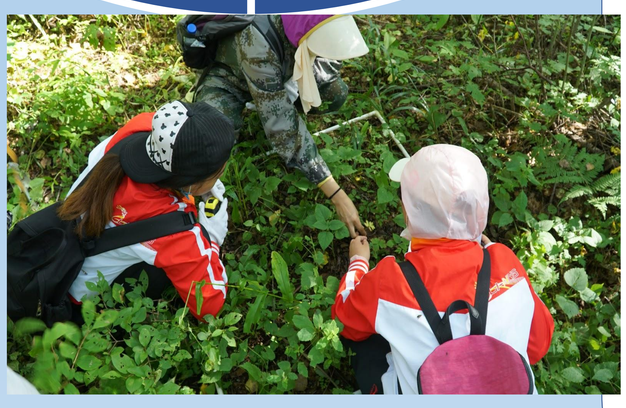

Figure 6: Setting of qudrat for herb survey

a. Place a 1 m x 1 m quadrat randomly in the sampling plot. (Figure 6)
b. Identify and select a herbs species in the quadrat.
i. Estimate the coverage of the selected species within the quadrat.
ii. Measure and record the leaf layer height in centimeters. (Figure 7)
iii. Count the total number of the herbaceous plants.
c. Repeat procedure 4b until all herbs in the quadrat are surveyed.
d. Sort out the survey data obtained, estimate the species richness, relative abundance, basal coverage, density and frequency each herbs species in the community.

(Li et al., 2016)

Figure 7: Measuring the height of the herbaceous plants within the quadrat