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摘要 通过 10a 的定位观测。研究了长白山地区针阔混交林结构的动态变化。树种及其分布基本保持不变。 林分密度从 404 株/hm<sup>2</sup> 降至 387 株/hm<sup>2</sup>,而基础面积从 44.83 hm<sup>2</sup> 降至 43.79hm<sup>2</sup>.除色木槭之外。冠层林 木的株数降低。优势树种的更新状况不佳。死亡与更新的关系表现在群落中植物组成的变化上。当红松开始 衰退时,落叶树种的优势明显上升。几种阔叶树的胸径分配与个体的大小相关。不同的胸径等级上的最大增 长率与树木本身大小量负相关。增加的胸径及其向下一个等级发展的趋势,暗示了冠层压迫对高生长的影 响.在成熟林的斑块内。树种不断地发生变化,而且斑块内具有一定的循环周期。林冠空隙→树木生长→树木 成熟→林冠空隙。上层林冠的树种中除色木槭外。都趋向于碱少种群数量。并且两种不同的更新方式和分布 范围揭示了树种更新的间断性。在群落的衰退阶段。树种的交替受优势树种变化的影响。

关键词: 物种组成, 胸径分布, 林木更新, 针阔视交林, 长白山。

# STRUCTURE AND DYNAMICS OF A TEMPERATE DECIDU-OUS-CONIFER MIXED FOREST IN CHANGBAI MOUNTAIN\*

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**Abstract** The changes in structure of a deciduous-conifer mixed forest in Changbai Mountain, northeast China, were investigated in a permanent plot with a 10-year interval. Species and size distribution remanined almost no changes. Stand density was reduced from 404 to 387 stem/hm<sup>2</sup>, and basal area from 44. 83 to 43. 79 hm<sup>2</sup>. All species in high canopy-layer except *Acer mono* decreased in number of stems. The regeneration of the dominant species was poorly represented. The death-recruitment relationship showed that the community was changing in composition. The dominance of deciduous components tended increasing while *Pinus koraiensis* was declining. The stand is considered a patch in its matured phase, and species change was in proceeding.

Key words: species composition, DBH distribution, regenration, deciduous-conifer mixed

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# forest, Changbai Mountain.

## 1 Introduction

Successional trend or species alternation in natural forest is the focus of forest dynamics. The stability of a forest ecosystem can be represented by the dynamics of its main tree species. Therefore, the survey of tree population dynamics is regarded as the important basis for researching the succession trend of forest communities. A common idea is that the dominant species in a climax community are generally shade tolerant, which can regenerate under canopy<sup>[1]</sup>. However, climax species often require proper light released from canopy, otherwise the survival possibilities of seedlings or saplings will be significantly reduced, and the ability to tolerate shade may decline as an individual grows<sup>[2]</sup>. Pinus koraiensis is such a species whose seedlings can not survive under its own canopy<sup>[3]</sup>, and its regeneration is discontinuouns<sup>[4]</sup>. This is regarded as the result of the undulation in light regime which is due to the turn over between canopy and gap. Most of the studies made on regeneration are limited in one species, the pine, while detailed information on the dynamics of all dominant or co-dominant tree species in the community is sparse. A long-term(with certain temporal intervals) survey of a community is the most reliable way to elucidate the mechanism of structural movements in ecosystem. This kinds of research is often difficult to schieve, because the forest vegetation which can remain intact during the long-term measurement, particularly in the managed forest which is of general cases, is vary rare. Natural conservation areas provide ideal sites for such approaches. This paper is intended as an investigation of the stand structure and its changes with time based on a permanent plot.

# 2 Study area and methods

The study plot was located in the northern slope of Changbai Mountain at an elevation of 830 m asl. Northeast China. The plot size was  $100m \times 100m$ . All trees of DBH > 8. 0cm were recorded and trees were numbered with tags. Crown map was drawn in the first survey. The reinvestigation was carried out in 1992, and  $DBH 3 \sim 8$  cm was added in the data set, but crown map was not redrawn. Growth rate was represented by the ratio of actual increment, of individuals marked in 1982 and survived in 1992, versus the size in 1982. Recruitment rate was expressed by the relative number of newly entered trees to the original density. For understanding the feature of the community, under growth was sampled in the last investigation. Shrub layer was investigated by randomly sampling about 200 individuals for determining the composition, and herb layer was recorded with density, height, and coverage, with 6 quadrats of  $1m \times 1m$ . With a character species, Forest type was named by the most dominant two tree species (by basal area) plus a character species.

#### 3 Results

### 3.1 Species composition and changes

The community was named Pinus koraiensis. Acer mono. Betula costata forest. The most prominent difference between this and other forest types is the high abundance of Betula costata which is therefore considered as a character species. Composition of the tree layer is shown in Table 1. The forest can be divided into at least 4 layers vertically. (Dhigh tree layer  $(20 \sim 30m)$ . dominated by Pinus koraiensis. Tilia amurensis and Acer mono. Pinus had the largest proportion of basal area. nearly 60%, and Tilia was  $13\% \sim 14\%$ . Betula costata. Ulmus japonica and Fraxinus mandshurica were scattered in this layer. (2) subcanopy layer  $(5 \sim 20m)$ . consisted of Acer triftorum. A. pseudo-sieboldianum. A. mandshuricum and Syringa amurensis. Acer triftorum presented the largest density. (3) shrub layer (<5m). consisted of 16 species (Table 2). and the coverage of this layer was estimated more than 30%. The main species were Acanthopanax senticosus. Philadelphus schrenkii. Corylus mandshurica and Deutzia amurensis. Ribes diacntha, which was generally