

【平成24年1月-3月授与分】博士學位論文内容の要旨 及び審査の結果の要旨

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学位の種類	博士(理学)
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学位論文題目	Community ecology of a subtropical maritime woodland (亜熱帯沿岸林の群集生態学的研究)
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論 文 内 容 の 要 旨

Coastal woodlands exist at the sea-terrestrial interface and consequently receive all the vagaries of maritime environments. The present study investigated the ecology of a small subtropical-temperate coastal woodland in Amakusa, western Kyushu, with particular reference to (i) local scale variation in community structure of trees between the edge and the interior, (ii) morphological variation of major species, and (iii) survival of dispersed seeds of the most

dominant species, *Quercus glauca*.

Despite on a small spatial scale, there was a significant change in tree assemblage structure in terms of relative abundance patterns, density, and morphology including tree sizes and multi-stemming tendency. Different niche apportionment patterns were confirmed in the two sites. While *Q. glauca* was predominant in both the edge and the interior, its dominance was less pronounced in the edge with a more equitable pattern of relative abundances of tree species. Comparing shade-tolerant versus shade-intolerant species, density of the latter was higher in the edge than in the interior, while a similar but non-significant trend was shown by the former. In three dominant tree species, *Q. glauca*, *Ligustrum japonicum* and *Pittosporum tobira*, the tendency of multi-stemming was significantly greater on the seaward edge of the woodland and declined towards the interior. Furthermore, tree height and size declined and canopy openness increased towards the woodland edge. In *Q. glauca* and *L. japonicum*, shoot growth was more pronounced in the interior than in the edge. Thus, spatial variation in tree structure manifested clearly as shorter height with greater multi-stemming tendencies and greater canopy openness (more spacing among branches/shoots) towards the woodland edge where more light is available and the impacts of sea wind and salt spray are greater.

In order to clarify the pattern of recruitment of the most dominant species, *Q. glauca*, the fate of post-dispersal seeds under different understory environments (areas covered by (i) a pteridophyte *P. lingua*, (ii) a ground-vine, *T. asiaticum* and (iii) no vegetation) was experimentally investigated from the germination stage to seedling emergence and establishment stages. Effects by rodents were greater in the no-understory habitat than in the *Pyrrrosia* and *Trachelospermum* habitats at early stages of development, while non-rodent-associated mortality was relatively more important towards the seedling establishment stage in all habitats. In the absence of predation/removal by rodents (i.e. the caged treatment), more seedlings survived in the no-understory habitat while seedlings were significantly taller in the *Pyrrrosia* habitat. In contrast, no significant difference was observed in either seed/seedling survivorship or seedling height among habitats where seeds/seedlings were exposed to rodent predation/removal.

論文審査の結果の要旨

This thesis dealt with the community ecology of a subtropical, semi-natural coastal woodland with particular reference to its community structure and recruitment-related dynamics. The study looked into the patterns and mechanisms involved in the abundance and life history characteristics of woodland trees in maritime environment through a combination of field observations and experiments in Amakusa, southwestern Japan.

The study revealed that in three dominant tree species, *Quercus glauca*, *Ligustrum japonicum* and *Pittosporum tobira*, the tendency of multi-stemming was significantly greater on the seaward edge of the woodland and declined towards the interior. Further, tree height and size declined and canopy openness increased towards the woodland edge. In *Q. glauca* and *L. japonicum*, shoot growth was more pronounced on the interior than on the edge. Thus, spatial variation in tree structures manifested clearly as shorter height with greater multi-stemming tendencies and greater canopy openness (more spacing among branches/shoots) towards the woodland edge where more light is available and the impacts of

sea wind and salt spray are larger.

The most important part of this thesis dealt with an experimental investigation into the fate of post-dispersal seeds of *Quercus glauca* under different understory environments. While consumption by rodents is often invoked as a major mortality factor for large-seed species of trees, its relative importance compared with other mortality factors is poorly known. The study employed a pair of caged and uncaged treatments to evaluate the impact of seed removal/predation by rodents, which enabled separating seed removal/predation mortality from mortality due to other factors. Effects by rodents were greater in the no-understory habitat than in the *Pyrrrosia* and *Trachelospermum* habitats at early stages of development, while non-rodent-associated mortality was relatively more important towards the seedling establishment stages in all habitats. In the absence of predation/removal by rodents, more seedlings survived in the no-understory habitat while seedlings were significantly taller in the *Pyrrrosia* habitat. Overall, this study in a humid maritime woodland has revealed the temporally variable influence of mortality factors and the context-dependent survival of oak seeds/seedlings, making a contrast to observations in drier woodlands; in the no-understory environment predation/removal effect was heavier but later survivorship was higher, while in vegetated environments predation/removal was reduced but survivorship was not high. This result has already been published in a prestigious international journal of plant ecology.

In the viva that lasted two and half hours, the candidate provided adequate answers to the majority of questions raised and the examiners were unanimously satisfied by the candidate's overall performance.

以上の結果は、近年人間活動に伴う破壊・衰退の著しい沿岸生態系海浜林に関する群集構造の解明に新しい知見をもたらしたものであり、海洋生物学の分野において価値ある業績と認められる。よって、本研究者は博士（理学）の学位を受ける資格があるものと認める。