DO SUBTROPICAL MONTANE CLOUD FORESTS IN TAIWAN ACT AS INSULAR SYSTEMS FOR WOODY SPECIES?
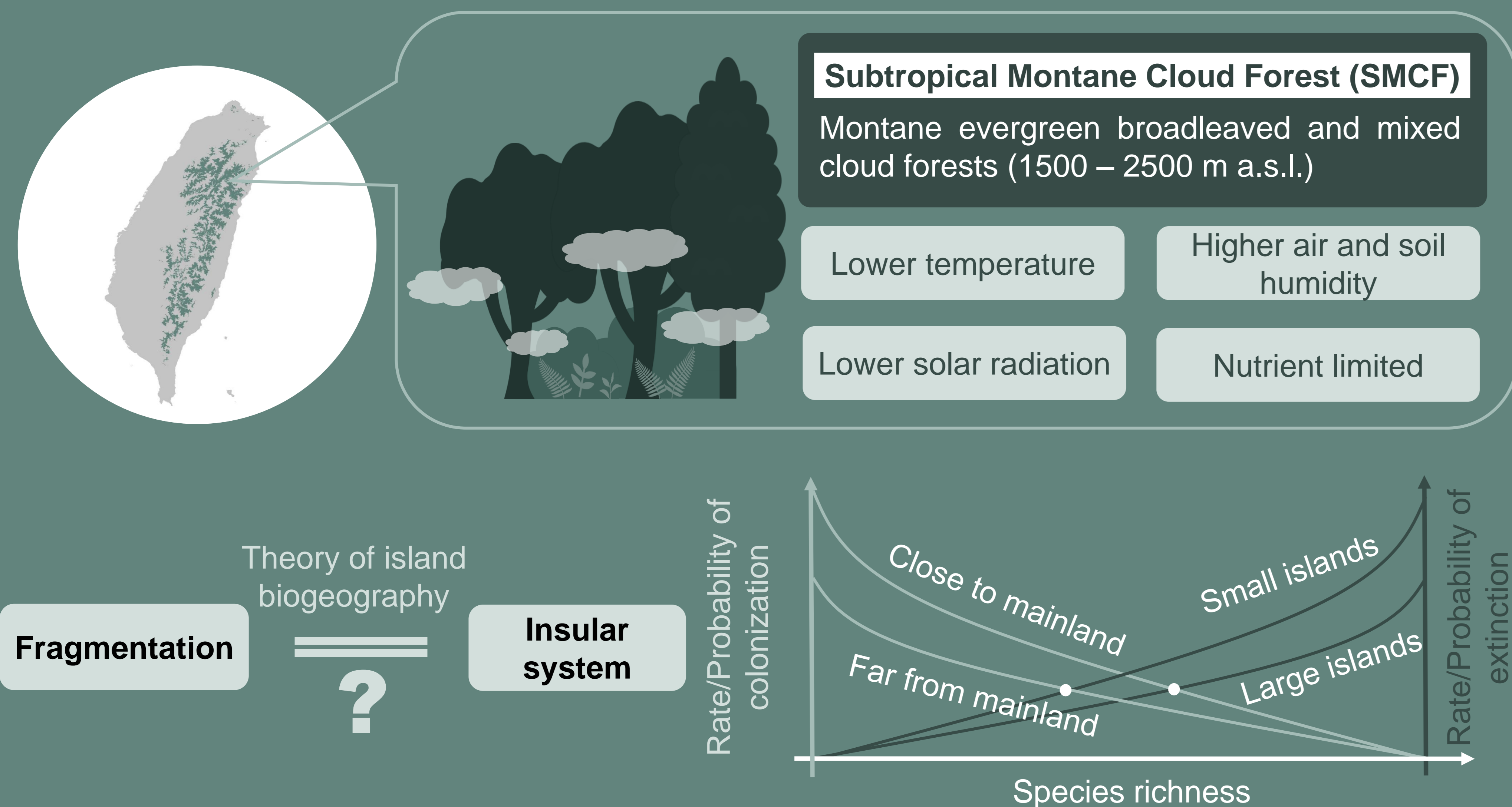
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INTRODUCTION

Subtropical Montane Cloud Forest (SMCF)
Montane evergreen broadleaved and mixed cloud forests (1500 – 2500 m a.s.l.)

Lower temperature	Higher air and soil humidity
Lower solar radiation	Nutrient limited

Theory of island biogeography

Fragmentation = **Insular system** ?

AIM — **Is there a relationship between the richness of woody species and fragment area in SMCF ?**
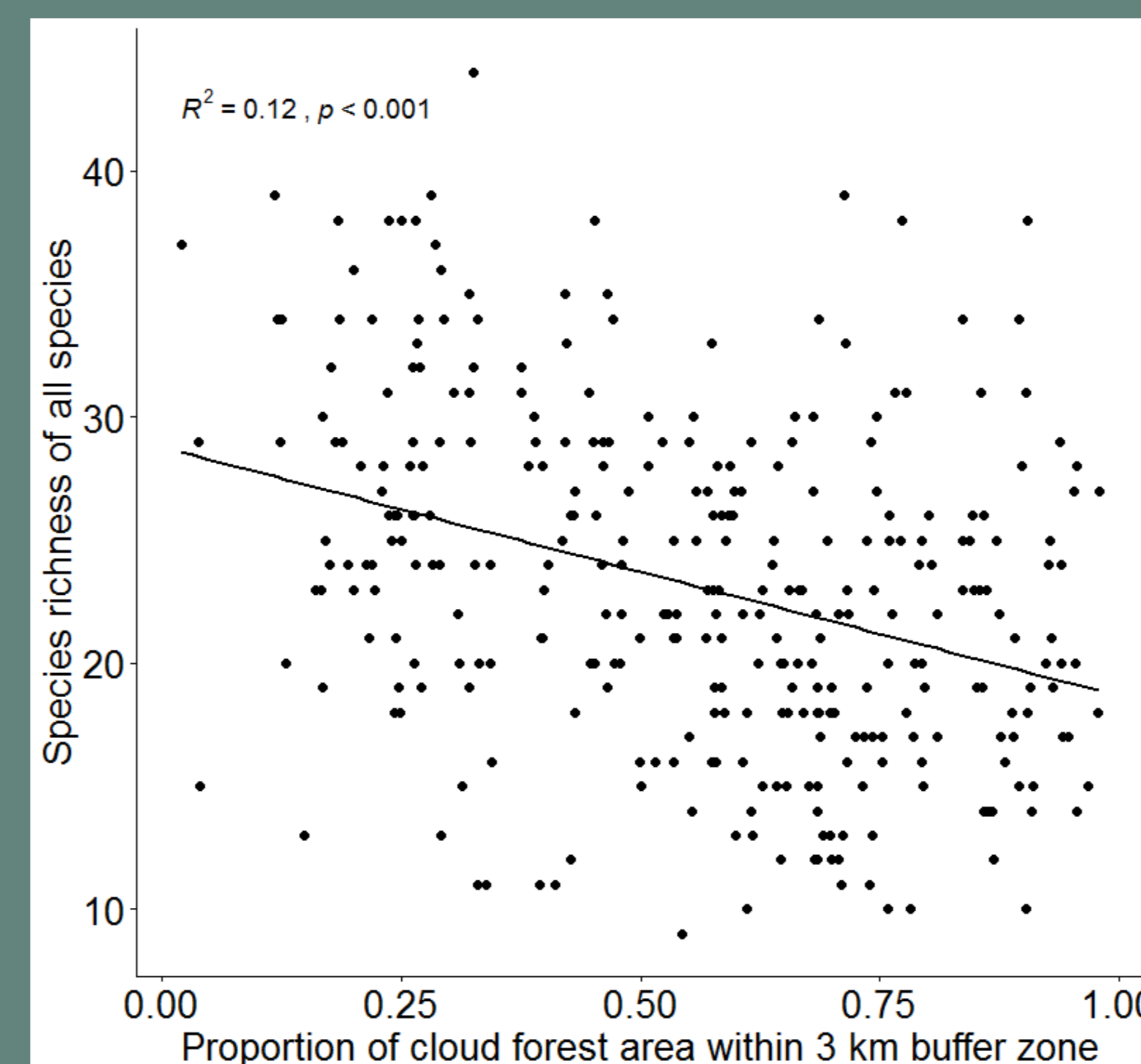
RESULTS

Fig 1. The negative relationship between the species richness of all species and the proportion of cloud forest area around each plot (R^2=0.12, P<0.001).

Negative relationship: may due to smaller islands having a higher chance to gain species through dispersal from the neighboring areas since a larger proportion of other habitats surrounds them
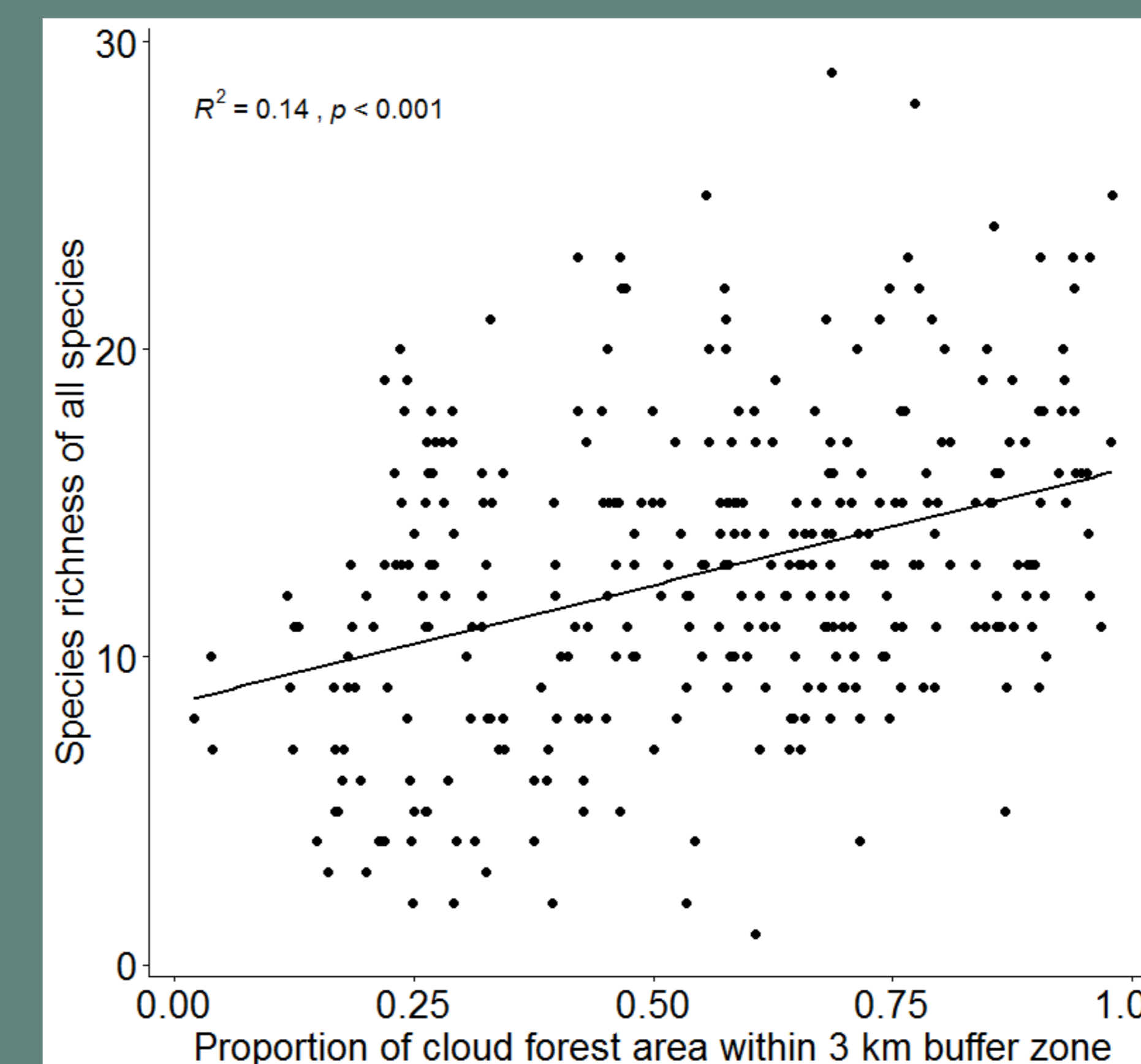
Fig 2. Significant positive relationship between species richness of specialists and the proportion of cloud forest area around each plot R^2=0.14, P<0.001) **by using 80% of the highest EIV for fog frequency to define specialists**.

Fig 3. Significant positive relationship between species richness of specialists and the proportion of cloud forest area around each plot (R^2=0.46, P < 0.001) **by using diagnostic species of cloud forest in Taiwan to define specialists**.

Positive relationship: vegetation plots of fixed 20 m x 20 m size surrounded by larger fragments of SMCF have higher richness, indicating that SMCF may act as an insular system
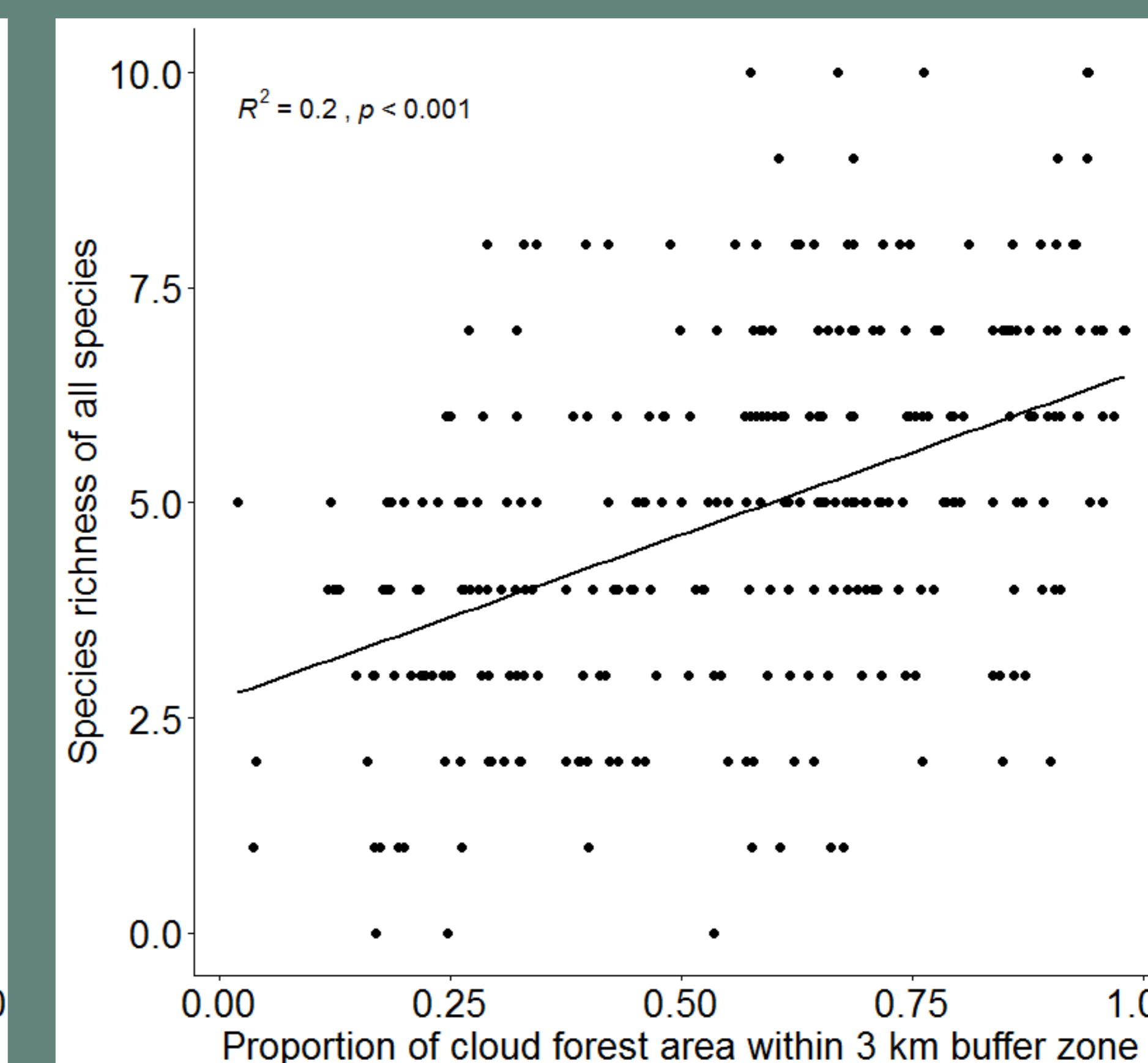
MATERIALS & METHODS

I. Vegetation plots
National Vegetation Database of Taiwan (AS-TW-001)
- *Chamaecyparis* montane mixed cloud forest - 155 plots (20 m × 20 m; on the ridge)
- *Quercus* montane evergreen broad-leaved cloud forest - 138 plots (20 m × 20 m; on the ridge)

III. Calculate the species richness and area of SMCF of each plot
- Using distribution map of SMCF in Taiwan (Shulz et al., 2017) to estimate the area of SMCF around each plot by using circular buffer zones with a fixed radius of 3 km.
- Due to data limitation, we additionally assume that species richness of the 20 m x 20 m vegetation plot is proportional to the species richness of the SMCF fragment occurring within the buffer zone.
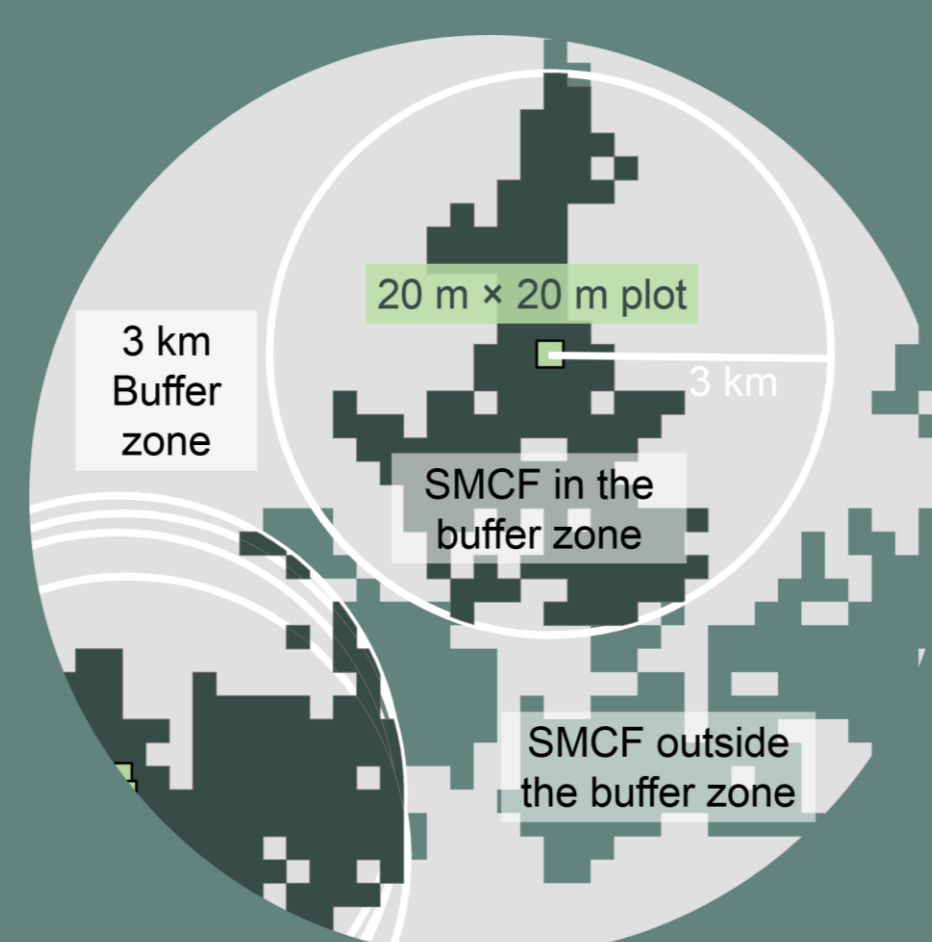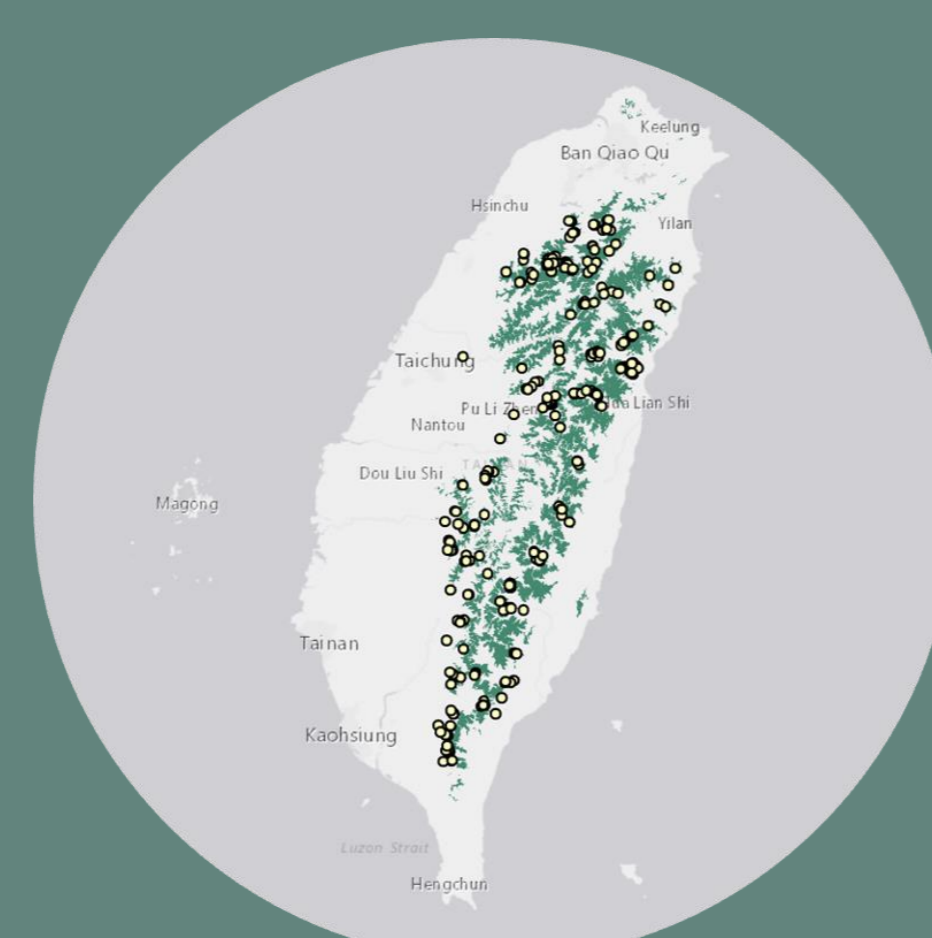
II. Define specialists and generalists

Ellenberg-type indicator value (EIV) for fog frequency	Diagnostic species of Taiwan forest vegetation (Li et al., 2013)
Specialists: 20% of the species with the highest EIV for fog frequency	Specialists: Diagnostic species of cloud forests

3 km Buffer zone — 20 m × 20 m plot — SMCF in the buffer zone — SMCF outside the buffer zone

IV. Analysis between species richness and area
Simple linear regression

CONCLUSIONS

1. We found a significant positive relationship between the species richness of cloud specialists in the plot and the proportion of the surrounding SMCF area around each plot, indicating that SMCF may act as an insular system.
2. This is important from a theoretical perspective (making SMCF a suitable system to study the effect of fragmentation) and also a practical perspective (e.g. for suggesting sustainable conservation strategies in the context of ongoing climate change likely further increasing of cloud forests fragmentation). We plan to do more investigations on other island properties of SMCF.

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Li, C.F., Chytrý, M., Zelený, D., Chen, M.Y., Chen, T.Y., Chiou, C.R., Hsia, Y.J., Liu, H.Y., Yang, S.Z., Yeh, C.L. and Wang, J.C., 2013. Classification of Taiwan forest vegetation. *Applied Vegetation Science*, 16(4), pp.698-719.

Schulz, H.M., Li, C.F., Thies, B., Chang, S.C. and Bendix, J., 2017. Mapping the montane cloud forest of Taiwan using 12 year MODIS-derived ground fog frequency data. *Plos one*, 12(2), e0172663.

Species composition and diversity — Yu-Pei Tseng — 93–PLT — IAVS2021