

Effects of abandoned paddy field use for the conservation of threatened hydrophyte after the 2011 Tohoku-oki tsunami

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1. Introduction

Threatened plant species, *Ottelia alismoides*, *Monochoria korsakowii*, *Najas graminea*, *Najas minor*, and *Chara braunii* were found in swampy paddy field after the 2011 Tohoku-oki tsunami Japan. These hydrophyte are classified as near-threatened or vulnerable species in the Red Data book of Ministry of environment, Japan. Hydrophyte communities were vanishing rapidly as reconstruction of road and agriculture proceeds. Therefore, surface soil of hydrophytes community was transplanted to abandoned paddy field 5km away from the original hydrophyte community.

In the present study, we transplanted soil seed to examine whether abandoned paddy field is effective for the hydrophytes species conservation. We investigated 1) whether hydrophytes including threatened species emerge and grow in the abandoned paddy field and 2) management methods of abandoned paddy field to conserve hydrophytes species.

2. Method

The study site was located at Hadenya district in Miyagi prefecture Japan (lat.38°38'37.9" N. and long.141°28'10.5" E). The vegetation survey conducted on July and September during 2014-2016 in accordance with the methodology of Braun-Blanquet (1964). The surface soil of paddy field was puddled by human power on April 2014 and 2015, and was strongly puddled by agricultural tractor on April 2016. The water temperature was recorded using a thermo-logger (Tidbit, Onset, USA) at the center of each quadrat frame in transplantation sites and donor seed bank. The water temperature was measured from May to September during 2014-2016 in transplantation site. The water depth was measured with ruler in the center of each quadrat frame.

3. Results

Monochoria korsakowii were recovered in transplantation site from 2014 to 2016. In particular, *Monochoria korsakowii* formed large community in 2016, and the volume of plant increased significantly higher than that in 2014 and 2015. *Ottelia alismoides* and *Chara braunii* were found in 2014 and 2016. The intensity disturbance with a agricultural tractor suppressed the flourishing of the herbaceous plants of *Phragmites australis* and *Typhaceae* spp. in 2016. Consequently, *Ottelia alismoides* and *Chara braunii* regenerated again in transplantation site. *Najas graminea* and *Najas minor* were not found during vegetation survey. *Salvinia natans* and *Alisma plantago-aquatica* were newly appeared in transplantation site. Our findings suggest that transplantation of surface soil including seed bank to abandoned paddy field is effective for the conservation of hydrophyte, *Monochoria korsakowii*, *Ottelia alismoides* and *Chara braunii*. The intensity disturbance for suppression of herbaceous perennial plant is needed to maintain the habitat of threatened plant species.

4. Conclusion

For the future, keeping the intensity disturbance with tractor is desirable on April. In addition, weeding of *Echinochloa* spp by human work is needed to conserve threatened plant species. Furthermore, we must develop the field at water depth 25 cm for the habitat of *Najas graminea* and *Najas minor* and re-transplantation. Long-term field monitoring is needed to elucidate frequency, intensity and period of

suitable disturbance and water depth to maintain threatened hygrophytes.

Keywords: Threatened plant, Seed bank, Soil disturbance, Abandoned paddy field, Tsunami