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Decomposition and nutrient dynamics of reed (*Phragmites australis* (Cav.) Trin. ex Steud.) litter in Lake Neusiedl, Austria

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Abstract

Common reed leaf and stalk litters were exposed in coarse (5 mm) and fine (70 μm) mesh bags at five sites from the landward to the lakeward margin of the reed belt of Lake Neusiedl, Austria. Additionally, some samples were exposed above water and in a reedless pool. After 863 days, leaves exposed below water had lost 51–85% of the original ash-free dry weight, depending on site and bag mesh size. Weight losses of stalks and of litter exposed above water were considerably smaller (15–32%). Decomposition was fastest at the lakeward site, slowest in the middle of the reed belt, and intermediate at the landward site. This rate correlated with concentrations of N, P, K and Ca, which were high after a short time in the litter at sites with higher decomposition rates. Leaves collected from one site and exposed at others showed that decomposition rates depended on site characteristics rather than on initial litter quality. Nutrient concentrations (N, P, K, Na, Ca and Mg), except of Fe, decreased during the first month, and all, including Fe, increased subsequently until the end of the study period. Changes of cation concentrations can generally be explained by cation exchange processes. Photosynthesis of epiphytes, carbonate precipitation and sediment incorporation can account for some of the changes observed. Increases in N and P, in contrast, seem to be controlled mainly by uptake by litter-settling micro-organisms. Of the various mathematical models tested, one including a temperature-independent labile fraction and a temperature-dependent recalcitrant fraction was the most successful.

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...Furthermore, if the harvest management is not employed, a serious internal competition for light resources caused by standing dead stem could retard the subsequent plant growth (Tanaka et al., 2016). Therefore, harvesting Phragmites in winter may improve the plant growth that increases N assimilation, and reduce the litterfall with greater proportion of stem to leaf, which in turn may affect

the litter-associated N dynamics of CWs because of the differences in decomposition rate between leaf and stem litter (Hietz, 1992; Gessner, 2000; Dinka et al., 2004). Previous quantitative analyses on the litter-associated N dynamics that are a part of decomposition have been primarily conducted in forest ecosystems....

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...The growth of P. australis has been studied extensively in the field (Hocking et al., 1983; Karunaratne et al., 2003; Windham, 2001) and by modeling (Allirand and Gosse, 1995; Asaeda and Karunaratne, 2000; Asaeda et al., 2002). The decomposition and nutrition dynamics of P. australis litter are relatively well-described, such as by Mason and Bryant (1975), Hietz (1992), Longhi et al. (2008), and Chimney and Pietro (2006). Furthermore, several studies have documented the effects of biological factors on P. australis decomposition....

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...However, most previous research on litter decay in estuarine systems has been conducted with plant material collected before natural senescence and death. The leaves of the salt marsh grass Spartina alterniflora (Newell et al., 1989) and the freshwater common reed P. australis (Hietz, 1992; Gessner, 2000; Menéndez, 2005) often remain attached to the shoot after senescence and death. In Mediterranean environments, these leaves generally fall from shoots at the beginning of autumn, when air temperature decreases and wind increases....

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