

The distribution of freshwater mussels (Unionidae) in floodplain waterbodies in relation to habitat quality and legacy

氾濫原水域における生息環境の質と履歴に関連したイシガイ科二枚貝の分布

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Degradation and homogenization of the riverscape are caused by the disruption of geomorphic processes due to landscape reclamation. Landscape alterations in the past may have “legacy effects” or past-impact effects that still control present habitat quality and mussel distribution. The influence of habitat legacy through environmental factors that affect mussel distribution in the floodplains of Ishikari River, Japan which underwent extensive land conversion since 1890’s was investigated. The presence, absence and density level of three species of unionid mussels namely, Ishigai, Numagai, and Funedobugai, were examined in 43 lakes with different historical formation (11 oxbow, 14 artificial, 13 marsh, and 4 unclassified lakes). Furthermore, the relationship of local habitat and spatial descriptors (e.g. EC and land-use) with lake types and mussels were investigated using Geographic information system (GIS) and generalised linear models (GLM). The estimates of water quality such as electrical conductivity (EC), dissolved oxygen (DO), organic matter percentage (OM) and spatial variables such as paddy area, drainage length and network land-use varied among lake types. Paddy fields was the dominant land-use which surrounded oxbow (mean \pm sd; $148813.26 \pm 97537.6 \text{ m}^2$) and artificial lakes ($130035.91 \pm 89554.5 \text{ m}^2$) with an EC of $14.10 \pm 4.1 \text{ S/m}$ and $16.28 \pm 4.3 \text{ S/m}$ respectively. Drainage length was shortest in marsh lakes ($2373.85 \pm 1140.1 \text{ m}$) with lower levels of EC ($11.71 \pm 3.2 \text{ S/m}$) but with higher organic matter ($46.05 \pm 33.3 \%$). Multi-variate models suggested that variables such as paddy area, EC, OM and drainage that are correlated with mussel distribution are also related to past landscape changes. Consequently, results demonstrated that Ishigai and Numagai occurred mostly at oxbow and artificial lakes whereas Funedobugai resided in isolated marsh lakes. This can be due to the lake type differences in terms of dispersal pathways which controls habitat accesibility. Moreover, the differences in habitat characteristics among lake types is related to the different reproductive strategies of among mussel species therefore influencing their distribution. This highlights the role of legacy effect on present freshwater mussel distribution. And thus, in order to enhance conservation and management efforts, the assessment of present habitat state as well as the role of past modifications are required.