



Comparison of benthic macroinvertebrates in three polyculture models of ponds stocking mainly *Ctenopharyngodon idellus*

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ABSTRACT

We investigated the distributions of benthic macroinvertebrates in land-based fish ponds (three polyculture models), mainly stocking *Ctenopharyngodon idellus*, and studied which environmental variables would lead to variation in macroinvertebrate community structure. We sampled benthic macroinvertebrates in nine ponds, three times from June to October 2010. Meanwhile, many environmental variables were measured. Sixteen species of benthic macroinvertebrates were identified. Aquatic insects made up the majority component of the benthic fauna samples. *Glyptotendipes lobiferus* and *Limnodrilus hoffmeisteri* were the most dominant species. Insect and Oligochaeta abundance showed clear change, and their density variation tendency was different in each of the three models. Redundancy analyses (RDA), including the Monte Carlo permutation test and forward selection procedure, showed LOI, TN_s , TP_s , pH, T, Chl-*a*, NO_2 -N and TP to be the most important environmental variables acting on the benthic macroinvertebrate assemblages ($P < 0.05$). General linear modelling (GLM) was applied to determine the relationship between certain benthic macroinvertebrate species and selected individual environmental variables. The results indicated that *G. lobiferus* was significantly negatively correlated to LOI ($P = 0.042$) and *Endochironomus nigricans* was positively correlated to T ($P < 0.001$), TP_s ($P < 0.003$) and TN_s ($P = 0.018$). *Tanypus* sp. and *L. hoffmeisteri* were abundant in high TP_s , TN_s , LOI and Chl-*a*, and scarce at high pH. *Branchiura sowerbyi* abundance showed a significantly positive correlation to TP_s , TN_s , LOI and Chl-*a*. Only *Tanypus* sp. abundance showed a significant positive relationship to TP. The relationship between macroinvertebrates and environmental variables suggested that the physicochemical characteristics of sediment had a more significant influence on benthos fauna than the water in artificial and cultivated ponds. From the macroinvertebrate assemblages similarity analysis, there is evidence that *Polyodon spathula* can make valuable contributions to the biodiversity and ecosystem stability of fish ponds. Further studies need to be conducted to confirm the finding and clarify its mechanism.

Keywords: Macroinvertebrates; Community structure; Biodiversity; *Ctenopharyngodon idellus* ponds; Polyculture models; RDA

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