Nitrogen cycling in the soil-plant systems along a series of coral islands affected by seabirds in the South China Sea

Libin Wu[1], Xiaodong Liu[1], Yunting Fang[2], Pingqing Fu[3] and Liqiang Xu[4]

[1] University of Science & Technology of China, Hefei, China. (L) wulbustc@mail.ustc.edu.cn.
[2] Institute of Applied Ecology, Chinese Academy of Sciences, Shenyang, China.
[3] Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China.
[4] Hefei University of Technology, Hefei, China.

Nitrogen (N) source and use strategy for plants have become the focus of phytoecology, and previous studies showed that they can response to climate and environment changes. However, there are still few studies on N cycling in coral island from the perspective of ecosystem evolution. Here, we aim to assess the impacts of seabird-driven nutrient transport on the N cycling in the soil-plant systems in coral islands. A series of coral islands affected by seabirds at different levels, in Qilian Yu, Xisha Islands, South China Sea, were investigated. Soils and two dominant plant species, *Scaevola sericea* and *Lepturus repens*, which are C_3 and C_4 plants, respectively, were sampled. The contents and $\delta^{15}N$ of TN, NH_4^+-N and NO_3^--N (IN) in soils; and TN, C/N, $\delta^{13}C$ and $\delta^{15}N$ in plant leaves, were determined. The content of phosphorus (P), one of the most important avian bio-elements, was also determined. Our data indicate that TN in soils is greatly influenced by TP. Accompanied by the increase of TP, TN, IN and $\delta^{15}N$ in soils become higher. As soil N increases, plant C/N decreases and $\delta^{15}N$ increases. When TN in soils is low, $\delta^{15}N$ in plant leaves is close to $\delta^{15}N$ of soil NO_3^- but far from that of soil NH_4^+ (with lower content relative to NO_3^-). When TN in soils is high, $\delta^{15}N$ values are all close. These data suggest that the growth of plants is closely related to N in soils. When the coral island is barren, soils, as well as plants, are N-limited and their main N source is highly likely atmospheric deposition. Influenced by N input from seabird guano to the soils, plants can use N from guano as the main N source and grow better, and NH_4^+ most likely accounted more for the N utilization of plants. Overall, our study emphasized the key role of seabird, the diversity of soil properties and plants N-acquisition strategies in coral island. It is instructive to predict future change of ecosystem and protect it.