

Soil Carbon and Nitrogen Beneath Aquacultural Ponds

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ABSTRACT

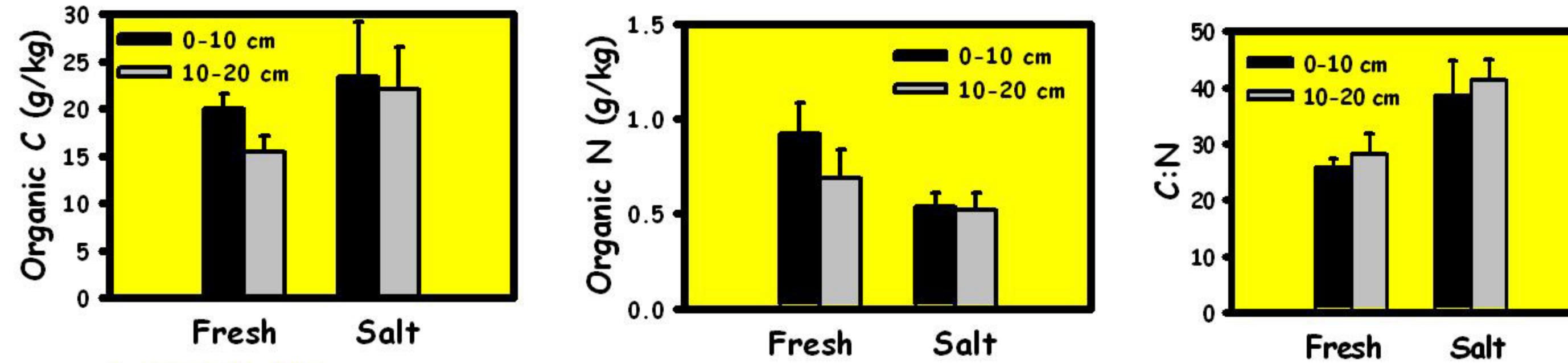
Pond bottom soils play an important role in regulating nutrient dynamics in aquacultural ponds. Further knowledge of carbon (C) and nitrogen (N) cycling patterns in bottom soils could improve pond management. The aim of this study was to determine amounts and potential mineralization of C and N in soils under aquacultural ponds. Soils under ponds were sampled in Thailand, Honduras, Kenya, and Peru. Soils were collected from three ponds at each site. Soil cores were taken to a depth of 20-cm, and divided into 0 to 10 and 10 to 20-cm increments. Soil organic C and N, and potential C and N mineralization were determined using standard methods. Concentrations of total C and N tended to be higher in pond soils than terrestrial soils. Potential C mineralization in pond soils was generally lower than that found in terrestrial agricultural soils. Potential N mineralization studies (both aerobic and anaerobic) revealed N immobilization rather than release in almost all cases, suggesting N limitation.

MATERIALS AND METHODS

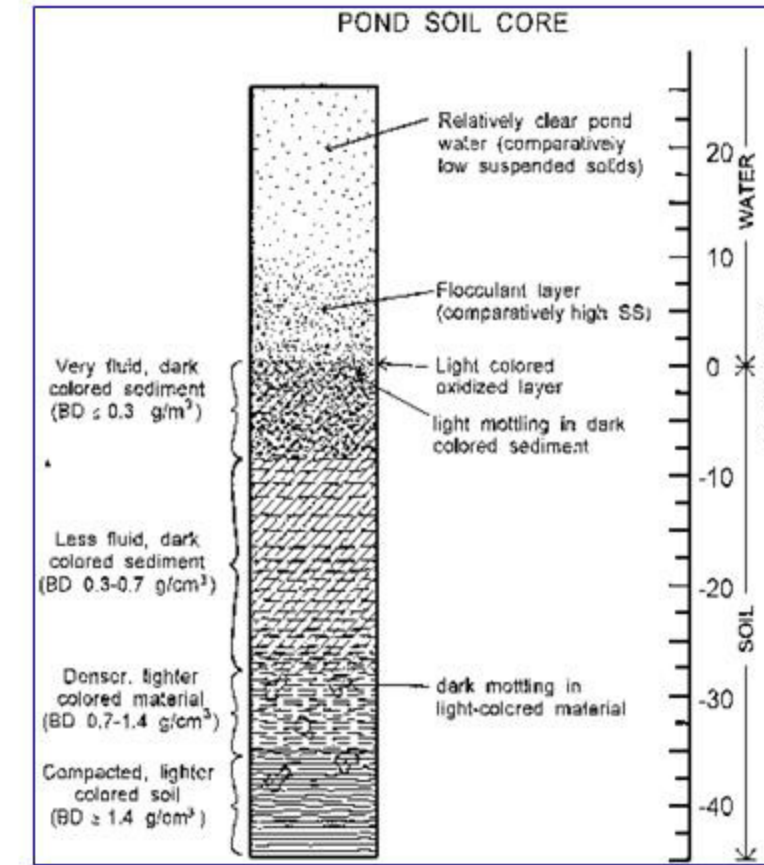
- Collected pond bottom soils from tilapia and shrimp ponds in Kenya, Peru, Honduras and Thailand from 1997 to 1999.
- Soils were collected from three ponds at each site.
- Soil cores were divided into 0-10 and 10-20 cm increments.
- AEROBIC Incubation: 30 days; 25°C; -12 kPa; captured respired CO₂ in NaOH; measure total N and C (LECO CHN-600) before 30-day incubation; measure mineral N via colorimetry before and after 30 day incubation.
- Soil organic C and N, and potential C and N mineralization were determined according to methods of Wood and Edwards (1992).
- ANAEROBIC Incubation: 7 days; 40°C (Keeney, 1982); measure NH₄-N via colorimetry before and after 7 day incubation.
- Respired CO₂: titrate excess NaOH with HCl in presence of BaCl₂



Pond soil sample collection.

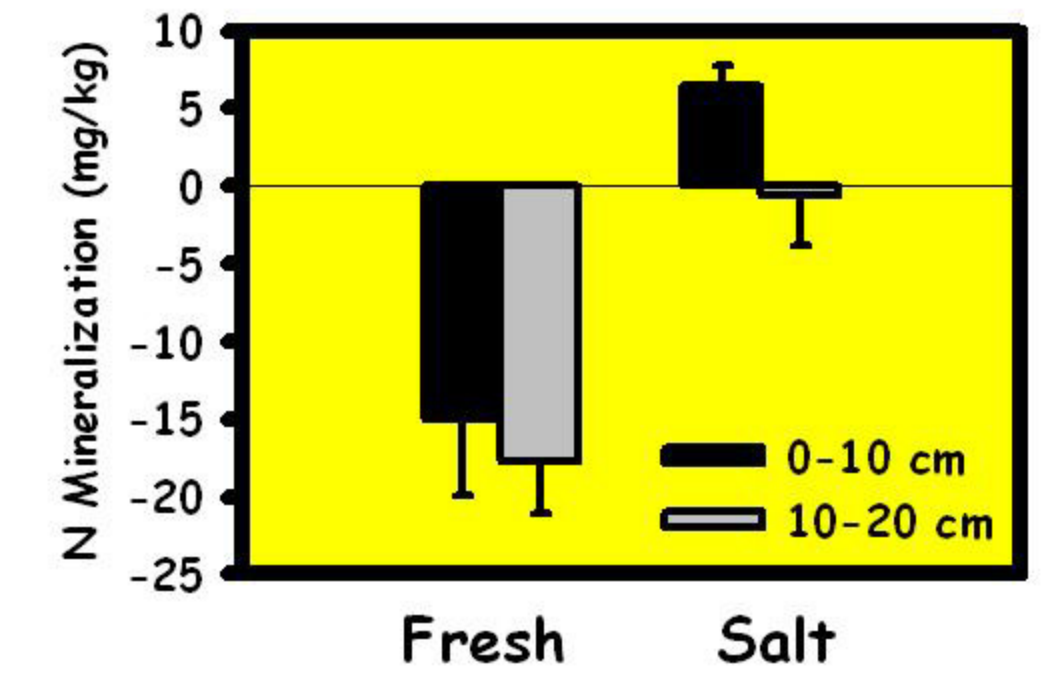


Pond Soil C and N: Organic C, Organic N and C:N ratio of pond soils from freshwater tilapia ponds and saltwater shrimp ponds.



Cleanout of shrimp ponds after harvest in Thailand.

Anaerobic Incubation



ANAEROBIC Incubation: N mineralization in soils from freshwater tilapia and saltwater shrimp ponds.

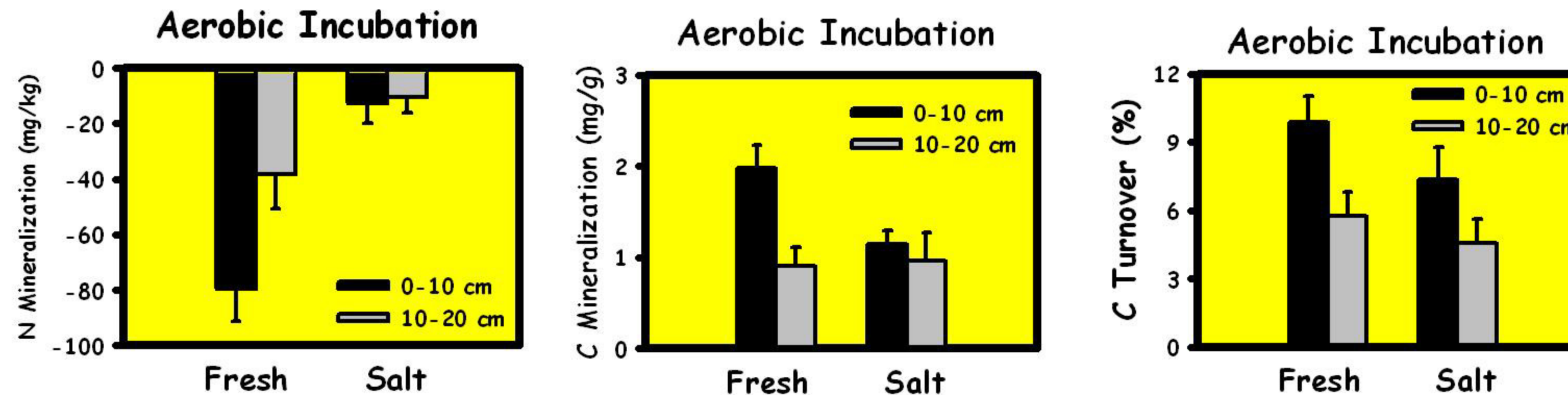
CONCLUSIONS

- Total C and N concentration in pond soils are similar to those in terrestrial soils.
- However, soil C:N are higher than typical terrestrial soils.
- Potential N mineralization is negative indicating N immobilization.
- Decomposition of organic matter in pond soils is N limited.

LITERATURE CITED

Wood, C.W., and J.H. Edwards. 1992. Agroecosystem management effects on soil carbon and nitrogen. *Agric. Ecosystems Environ.* 39:123-138.

Keeney, D.R. 1982. Recommended biological index - ammonium-nitrogen production under waterlogged conditions. p. 727-728. In Page et al. (ed.) *Methods of soil analysis. Part 2.* 2nd edition. Agron. Monogr. 9. ASA, SSSA, Madison, WI.



AEROBIC Incubation: N mineralization, C mineralization and C turnover in soils from freshwater tilapia and saltwater shrimp ponds.