Indoor recirculating aquaculture systems (RAS) for the production of shrimp are a potentially sustainable alternative to traditional pond culture systems in terms of water conservation and reduced impact on receiving water quality. RAS systems consist of a shrimp production tank and one or more biofilters for water treatment. Microorganisms in the biofilters have a critical role in maintaining water quality in the production tank. Therefore, a better understanding of microbially mediated nitrogen transformation processes in indoor RAS can help improve performance through appropriate operational modifications. Furthermore, a reduction in commercial shrimp feed may be possible through the use of biofilter biofilm as a supplemental feed source for shrimp. This research: (i) examined the microbial community in the trickling filter of a local (Okemos, MI) indoor, zero-discharge RAS used in the production of Pacific white shrimp, _Litopenaeus vannamei_; (ii) analyzed the operation of an indoor, zero-discharge RAS under simulated intensive growth conditions, at least 100 shrimp per m² of tank area, in the laboratory, as well as investigated the impact of ammonia concentration on nitrifying microbial populations; and (iii) examined the impact of biofilter biofilm as a supplemental feed source on shrimp growth and survival.