DISSERTATION

TROPHIC ECOLOGY OF FISH COMMUNITIES IN THE BRUSH PARK FISHERY OF NEGOMBO ESTUARY, SRI LANKA, AND STRATEGIES FOR CO-MANAGEMENT

Submitted by

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ABSTRACT

Brush park fishery or locally called "*mas athu*" in Negombo estuary, Sri Lanka is a form of traditional small-scale fishing practice, which relies on fishes attracted to artificial woody fish aggregation devices constructed in shallow regions of the estuary. The fish species attracted to brush parks exhibit a wide range of morphological features and dietary habits. In the present study, an attempt was made to investigate whether coexistence of constituent species in these brush parks exhibited morphological variations in relation to their dietary habits, and whether such fish communities attracted to brush parks could be grouped into trophic guilds and if so, how divergence within a trophic guild contributes to structure the fish community along trophic dimensions. An attempt was also made to empirically verify adoption of fishers' traditional ecological knowledge (TEK) accumulated over generations through experience for the sustainable management of brush park fisheries.

The present analysis was based on 817 specimens belonging to 24 families that were caught in brush parks in Negombo estuary, from April 2014 to April 2016. In each specimen, 17 morphological attributes were determined and diet composition of each species was analyzed in terms of relative biovolume of 11 broader taxonomic groups. Levin's index of niche breadth was calculated to define relative level of diet specialization. Data were collected from 245 brush parks with a view to empirically verifying TEK of brush park fishers. The institutional robustness of the community-based management system was assessed for compliance with Ostrom's modified design principles.

Principal component analysis of morphometric attributes and dietary habits indicated that the species in the higher trophic levels were characterized by slender, long body shapes and those occupied lower trophic levels were predominantly laterally compressed with deep body shapes. Based on the mean composition of food items, they could be grouped into 8 trophic guilds. Levin's index of niche breadth indicated that the constituent species in the trophic guilds for which food was abundant, were generalists having greater dietary overlaps among species, whereas the trophic guilds of higher trophic levels were specialists reducing inter-specific competition.

From this research it could be concluded that the predictive power of ecomorphological correlates with diets of fish species, other than mugilids having peculiar feeding habits, which are attracted to brush parks, can be considered as a useful tool for conducting rapid ecological assessment. In each trophic guild, constituent species represented different trophic indices indicating trophic divergence and less inter-specific competition.

It was evident that the degree of community-based fisheries management that exists in the brush park fishery is not sufficient for governance of the dilemma of common pool resources (CPR). Since community rights of brush park fishers were not strong enough to make responsible fisheries management, there would be potential for integrating some institutional design principles through intervention of centralized management authorities. As such, co-management regimes that empower local communities to contribute to management decisions are essentially needed for the sustainability of the brush park fishery and exploitation of allied resources in the estuary.

Keywords: artificial fish shelters; community-based fisheries management; dietary habits; ecomorphology; local ecological knowledge; trophic index