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Diet Overlap between Introduced *Catla catla, Labeo rohita* and the Native *Systomus sarana subnasutus* in Vellayani Freshwater Lake, Kerala Southwest Coast of India

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Abstract

The present study was undertaken to document the gut contents of the exotic species, Catla catla and Labeo rohita and the main indigenous fish Systomus sarana subnasutus in Vellayani Fresh water Lake at Thiruvananthapuram, so as to ascertain the possibility of dietary overlap between the indigenous and exotic fishes due to the introduction of non native fishes for enhancing fish stock has been going on in the lake from 2010 onwards. The study was carried out from August 2013 to July 2014. Gut content analysis was done by Points method (Hyslop, 1980). The extent of diet overlapping was assessed using Percentage of diet overlap. For S. sarana subnasutus, the major food items were Chlorophytes (20.06%) closely followed by Cyanophytes (19.43%) and followed by Chrysophytes (12.08%). The major food items of C. catla and L. rohita were also cyanophytes, chlorophytes and chrysophytes. Percentage of diet overlap was found to be above 60% showing that dietary overlapping is significant, and in the long run, this may lead to negative impacts on the breeding and reproduction of the native species.

Key words: Dietary overlapping, Introduced species, Native fishes, Vellayani Freshwater Lake

I. INTRODUCTION

Vellayani Lake is one of the largest freshwater lakes in Thiruvananthapuram district of Kerala which is extensively used as a source of drinking water as well as agriculture. Since 2010, the Department of Fisheries, Government of Kerala has come up with a project to enhance the fish stock in Vellayani Lake, by introducing non native fishes, Indian major carps like Catla and Rohu. *S. sarana subnasutus* is an indigenous and major food fish in this lake. They are the major small fish items in the commercial catches. The present study aims to document the gut contents of introduced species and the native species *S. sarana subnasutus* in the lake and thereby attempts to draw conclusions on the possibility of dietary overlap between them.

II. MATERIALS AND METHODS

2.1 Study Area

Vellayani Lake (8^o 24' 09"- 8^o 26' 30"N & 76^o 59' 08"- 76^o 59' 47" E) is one of the largest freshwater lakes, in Thiruvananthapuram district of Kerala. The lake is situated 29 meters above mean sea level. The length of the lake is about 3.15 km and its maximum width is about 1km, while the depth of the lake varies from 2 to 6 m. The site was specifically selected for the dietary overlap studies due to the ongoing fish stock enhancement program of the Department of Fisheries, Govt. of Kerala by which

Indian major carps, which is not a native fish of this lake, has been stocked with the indigenous fishes in the lake.

2.2 Sample Collection

The study was carried out during one year period from August 2013 and July 2014 in Vellayani Lake. During the study period, fishes were sampled twenty five times. All samples were collected by 'Pattu Vala', a type of seine net, in the night (between 6 pm & 7 am). Specimens of this species were collected and brought to the Laboratory for taxonomic identification. The identified specimen is preserved at the Laboratory of the Fatima Mata National College, Kollam, under the University of Kerala.

Collection of gut content: The body cavity of each fish was carefully opened. The anterior gut was opened up to the duodenum and the contents were carefully preserved immediately in 10% Formalin for further analysis. The preserved gut content was then examined under simple and compound microscopes. The gut content analysis was done by Numerical method proposed by Hyslop (1980). Food items were identified to genus level and quantified. Keys used to identify plankton were those of Datta *et. al* (2010), Pentecost (1984) and Adoni *et. al* (1985). The diet overlap was assessed using Percentage of diet overlap.

III. RESULTS AND DISCUSSIONS

3.1. Components of gut content: The gut contents of sampled fishes from Vellayani Lake were grouped into thirteen categories. They are Cyanophytes (Blue green algae), Chlorophytes (Green algae), Chrysophytes, Macro hydrophytes, Protozoans, Rotifers, Cladocerans (water fleas), Copepods, Nematodes, Annelids, Molluscs, Insects and Larvae and Detritus matters. Table 1 shows the percentage of preferred food groups of *Catla catla, Labeo rohita* and *S. sarana subnasutus* . Table 2 shows the diet overlap between the non native *C. catla,* L. rohita and the native *S. sarana subnasutus* .

Table1: % of Preferred Food Groups of Selected Fishes

% Food groups of fish species			
Food species	*C. catla*	*L. rohita*	*S. sarana subnasutus*
Cyanophytes	19.79	17.29	19.43
Chlorophytes	21.93	16.22	20.06
Chrysophytes	14.97	14.29	12.08
Macro hydrophytes	5.99	12.36	9.24
Protozoans	1.6	1	1.26
Rotifers	9.52	3.47	4.52
Cladocerans	1.18	2.16	1.26
Copepods	13.69	1.39	7.98
Annelids	0.64	0.31	1.26
Molluscs	0.53	0	0.32
Insects and larvae	7.49	7.57	7.04
Detritus matters	2.67	23.94	11.76

S. sarana subnasutus is the food fish of commercial importance in the lake and hence the comparisons were done against the gut content of non native species. The major food items present in the gut content of *S. sarana subnasutus* are the Chlorophytes (20.06%) closely followed by Cyanophytes

(19.43%) and followed by Chrysophytes (12.08%). In the gut contents of *C. catla*, the major food item was Chlorophytes (21.93%) followed by Cyanophytes (19.79%). Chrysophytes were present up to 14.97%. The major food items in the gut contents of *L. rohita* are Cyanophytes (17.29%) and Chlorophytes (16.22%). A quantity of 14.29% of Chrysophytes is also present in the food items of this.

Table 2: Diet Overlap between Non Native and Native Fishes

% of diet overlap		
Food groups	*C. catla* and *S. sarana subnasutus*	*L. rohita* and *S. sarana subnasutus*
Cyanophytes	98.18	88.99
Chlorophytes	93.94	80.86
Chrysophytes	80.69	84.53
Macrohydrophytes	64.83	74.77
Protozoans	78.75	79.37
Rotifers	47.48	76.77
Cladocerans	93.65	58.33
Copepods	58.29	17.42
Annelids	50.79	24.6
Molluscs	60.38	0
Insects and larvae	93.99	93
Detritus matters	22.7	49.12

3.2. Comparison of the gut content between introduced species and *S. sarana subnasutus*

All the major food items of *S. sarana subnasutus* were found to be forming a part of the food of the two introduced species. The comparison is presented in Table 2. Major gut components of *S. sarana subnasutus* like Cyanophytes, Chlorophytes and Chrysophytes were found to be consumed in equal quantities or more by the introduced species.

The results give clear indication of dietary overlap between the species under consideration. Similarity between diets and dietary overlap between two species indicates their potential for trophic interactions (Qin *et al* 2007). High diet overlap between two species may indicate competition only where and when available food resources are limited (Pianka 1974; Sale 1974). There are also evidences for competition between the introduced and native fishes for the preferred food organism, when there was a dietary overlap (Copp *et al* 2008). In the present study, the diet overlap between the major food items of *S. sarana subnasutus* and *C. catla* were Cyanophytes 98.18%, Chlorophytes 93.94% and Chrysophytes 80.69%. In the case of diet overlap between *S. sarana subnasutus* and *L. rohita*, Cyanophytes were 88.99%, Chlorophytes were 80.86%, and Chrysophytes were 84.53%. The results clearly show that there is dietary overlap; which in the long run may lead to negative impacts on the breeding and reproduction of the native species.

The Percentage of diet overlap is considered significant when its value exceeded to 60%. In the present study also, found to be significant as the Percentage of diet overlap for all the major food items and the percentages were always above 60. From this study, all the diets of both the introduced species are similar to that of the primary native species in the lake.

IV. CONCLUSION

The result of the present study shows that the dietary overlap between the native species and the introduced species is significant, and there is the possibility for negative impacts affecting the native species, *S. sarana subnasutus* in the long run. However the long term impacts on the breeding and reproduction of *S. sarana subnasutus* due to introduced species requires a long term monitoring of the dynamics of the fish stocks.

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