

FREQUENCY DISTRIBUTION OF AVERAGE NICHE OVERLAPS OF SOME DOMINANT FRESHWATER OLIGOCHAETES

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ABSTRACT

Frequency distribution of average niche overlaps was studied and found that no interspecific [(average of two pairs) interaction was without overlapping of niche and also that no overlap was less than 20%. It was observed that 5% of interactions were between 20 to 30% overlapping range and similarly 15% between 30 to 40%, 10% between 40 to 50%. On the whole 65% of interactions were found to show more than 50% of overlapping of niche. The niche overlapping frequency has been discussed in particular reference to resource diversity in the habitat.

Key words: Niche overlap, Frequency distribution, Oligochaetes.

Introduction

Hutchinson's hypervolumetric multidimensional niche concept (1957) has been developed further by Mac Arthur and Levins (1967), Mac Arthur (1968); Levins (1968). To Levins (1968) the niche is a "fitness measure on an environmental hyperspace. Thus corresponding to each point in the environmental hyperspace there is a measure of probability of survival and reproduction in that environment. "The fundamental niche is the part of phenotype and is modifiable only by way of natural selection, while the realized niche is the environment to which the organism is limited by competition or other biological interactions. Realized niche is the part of an organism's niche which allows the competition to occur and is overlapped by similar niche portions of the interacting species. The extent of overlap thus indirectly becomes a measure of interspecific competition. The interaction within a community becomes a very large scale activity as the number of interactions are nothing but the permutations of the

number of species. The frequency distribution of niche overlaps among the different species of a community will thus reflect the extent of competitive process and thereby the probability of increase or decrease of species diversity in the community.

The review of literature reveals that no such work has been published so far on freshwater tropical oligochaetes, the present communication provides certain basic information on the niche overlap frequencies.

Material and Methods

Oligochaetes were sampled along with other macrobenthic fauna following standard methods described in detail elsewhere (Sinha *et al.*, 1989). The oligochaetes were sorted out and preserved in the laboratory and their population density per square metre was calculated averaging five samples each consisting of seven replicates. All the samples were taken from different points and nearly at the same time.

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The methods of Levins (1968), Hurlbert (1978) along with Pianka's modification (1975) were adopted to assess the niche overlap values among various interspecific permutations of five dominant species of oligochaetes namely *Branchiura sowerbyi* (*B. sow*), *Limnodrilus angustipennis* (*L. ung*), *Limnodrilus udekemianus* (*L. ude*), *Aelosoma* sp. (*Aelo* sp.) and *Dero* sp. (*Dero* sp.). On the basis of the data so obtained the frequency distribution of average niche overlaps for various interspecific pairs was calculated and presented in Fig 1, as histograms. Further based on average niche overlap in a pair of interspecific interaction [$\alpha \times (y) \times \alpha y (x)$] as suggested by Levins (1968) and UPGMA dendrogram was drawn (Fig 2) to show the extent of niche overlap following Sneath and Sokal (1973).

Result and Discussion

The possible number of interspecific among five dominant oligochaete species has been calculated and the frequency distribution of niche overlaps among them has been presented in Fig 1. The ranges of interspecific interactions corresponding to the extent of niche overlaps have been placed in Table 1. The Fig 2, a dendrogram based on average niche overlap in a pair of interacting species among the five selected species clearly shows that the average niche overlap ranges from 0.024 to 0.91 i.e. between *Limnodrilus angustipennis* and *Limnodrilus udekemianus* and also between *B. sowerbyi* and *Dero* sp.

The frequency distribution of niche overlaps shows that for the studied oligochaetes it varies from 21% to 99% which are the minima and maxima of the range. The niche overlap value if comes around one, it means hundred percent or complete overlapping of realized niche of the species concerned by the same of the other species, while if it comes to be zero, it indicates

no overlapping at all and thereby no competition. No interaction was found without overlapping and also there was no overlap less than 20%. The results showed that 5% of interactions were between 21 to 30% of overlapping; 15% interactions between 30 to 40% and 10% interactions between 40 to 50%. Maximum interaction values i.e. 20% was between the range of 50 to 60% of overlapping, while only 5% between 60 to 70% of overlapping. In 70% onward range of overlapping 15% of interactions were observed for each range.

In the present study it has been found that 65% of interactions have more than 50% niche overlapping. This result suggests that in majority of interspecific interactions more than half of the realized niche have been overlapped. This type of overlapping is an indication of diversification of resources in the habitat for the species encountered and that each species is capable of utilizing variety of resources (Pianka 1974). Communities with fewer diversified resources support fewer number of species than the great variety of resources (Mac Arthur 1972). Thus higher frequency of niche overlapping is associated with higher species diversity in the community.

Further more the results also depict that 65% of the interspecific interactions has 50 to 99% of niche overlapping suggesting high species richness in the community because communities with high niche overlap values among the component species similar to the present observation support high species richness in comparison to those with low overlapping (Pianka, 1974).

The dendrogram (Fig 2) reveals that out of five species considered in the present study two

Frequency distribution of average niche overlaps of some dominant freshwater oligochaetes

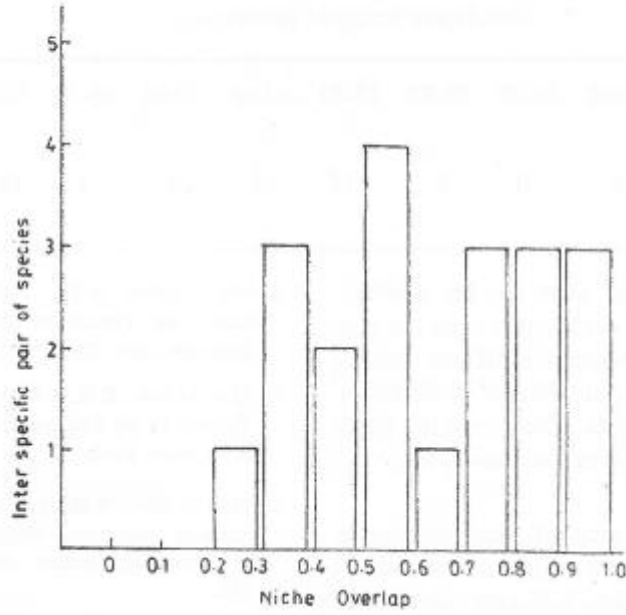


Fig. 1—Histogram showing niche overlap among interspecific pair of littoral Oligochaet species.

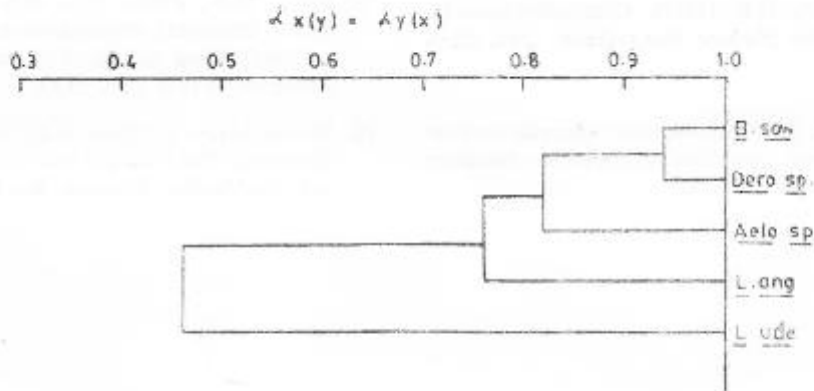


Fig. 2—Dendrogram showing the niche overlap between the most abundant five Oligochaet taxa as $\alpha_x(y) \times \alpha_y(x)$ (Levin, 1968). Species order coded as text.

TABLE - 1

The range of interspecific interaction corresponding to the extent of niche overlap in terms of percentage

Extent of niche overlap	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Range of interspecific interaction	0	0	5	15	10	20	5	15	15	15

species *B. sowerbyi* and *Dero* sp. are ecologically more close to each other than the rest three species. The ecological closeness points out the coincidence of similarity in preferences for various requirements which form the basis of coexistence of species in the community.

Thus higher frequency of niche overlap in one hand point out to the extent of competition while on the other, it also indicates coincidence of similarity in preferences.

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