DISCUSSION

The present study revealed some interesting findings about the nematode community of the wetland, Keetham Lake. Firstly the taxonomic diversity of the wetland revealed interesting array of species from all orders of soil and aquatic nematodes. About fifty seven species were identified of which twenty three have been reported in the thesis with detailed descriptions. Twelve species have been reported as new to science while two have been reported for the first time from India.

The superficial division of the wetland into zones A, B and C for the sake of making the analysis easy, did not reveal much difference in nematode community characteristics. The overall nematode counts over the sampling sites ranged widely from 300-1041 individuals per 400 ml of soil, showing immense variation in substrate conditions and indicating some sites to be extremely dry and nutritionally deficient for nematode survival. Such sites indicated presence of basal indicators i.e., Cephalobidae. The wide range of nematode numbers i.e., 52 to 9,166 nematodes per 200 cm³ soil has also been reported by Niblack and Bernard (1985).

Despite extreme variability in nematode numbers at different sampling sites the nematode fauna of the wetland was found to be in dynamic equilibrium representing all trophic groups. The total generic diversity of nematodes in the wetland was fairly high with fifty five genera represented by fifty seven species. However, the bacterivores showed the greatest generic and species diversity and constituted 25-46% of the total species of individual zone.

Ten species Acrobeleoides nanus, Aphelenchus avenae, Tylenchorhynchus mashhoodi, Mesodorylaimus subtiloides, Discolaimus similis, Chiloplaucus subtenuis, Mylonchulus hawaiensis, Helicotylenchus dihystera, Panagrolaimus hygrophilus and Mesorhabditis anisospicula sp.n. were found to be most important of the total fifty seven species identified and constitute about 35.98-50.70% of total nematode community. The high frequency and dominance of these species also indicated their greater competence in variable environment types hence cosmopolitan occurrence. Similar findings were reported by other workers when six of twenty-two species made up 91% of the nematode populations (Eder & Kirchengast, 1982) while Beier & Traunspurger (2003b) reported seven of seventy-one nematode species to constitute 71% of total nematode population.
Although extensive, the list of species may not be complete due to the fact that all species may not have been recorded as they could not have been extractable, in a life stage that could not have been sampled due to specialized microhabitats, at densities too low for detection or present at restricted time of the year. In the samples the endoparasites *Heterodera* and *Meloidogyne* could not be found largely due to the fact that the samples largely comprised of soil and not plant roots. However, the juvenile of the above pests were not observed in the samples collected from around the roots. Similar reports by Talavera & Navas (2002) also conform to this finding who could not find root knot nematodes in grassland samples.

Among the trophic groups, bacteriovores were the dominant groups responsible for dissemination of bacterial/ microbial populations. The largely aquatic habitat i.e., Zone A and the Core zone (Zone C) showed relatively smaller trophic diversity index (TDI). Rhabditida being highly diverse and competent was the most numerous taxon. Barring the aquatic habitat of zone A, the substrate conditions of the wetland in zone B and C remained dry with low to moderate enrichment hence the other group, dominant and numerous was Dorylaimida indicating towards stability of the wetland ecosystem. Rhabditids in dry substrate were predominantly the Cephalobidae, the basal indicators.

*Acrobeloides nanus, Chiloplacus subtenuis* of family Cephalobidae and *Panagrolaimus hygrophilus* of family Panagrolaimidae all represent the smaller c-p values. However the species of family Cephalobidae preferred and tolerated well, an environment with low moisture/ drought conditions (Dmowska, 2000 and Yeates, 2003). On the other hand, presence of *Panagrolaimus* was correlated with enriched conditions of the substrate.

Some species that were more frequent at the sites of organic enrichment as well as the conditions of low oxygen concentrations were *Mesorhabditis anisospicula* sp. n., *Teratorhabditis synpapillata, Diploscapter coronatus, Butlerius butleri, Oigolaimella paraninae* sp. n., *Geomonhystera villosa* etc. The species exclusively found in anoxic conditions, were *Panagrolaimus hygrophilus, Monhystrella dorsicurvata* sp. n. and *Tobrilus longus*. These species were largely absent in samples from open water zone (having plenty of oxygen). The prevalence of these species in the shore samples of Zone A of the wetland indicated some anthropogenic
disturbances largely because of the activities of visitors and the conditions of organic enrichment and eutrophication leading to oxygen depletion.

The dominant herbivores/plant parasites viz., *Helicotylechus dihystera*, *Hemicycliophora dhanachandi* and *Hemicriconemoides brachyurus* indicated towards successful phytoparasitic associations. The presence of woody plants, the *Acacia nilotica* forest justified fairly well the dominance of plant parasites with pharyngeal overlap. Though largely categorized as ectoparasites they led to compensatory plant growth (Monteiro et al., 2014). The presence of sensitive Longidoridae indicated stability of environment. Furthermore, the abundance of the nematodes with overlapping pharyngeal glands viz., *Helicotylenchus dihystera* also reflected a stable habitat as reported by Bongers (1990). The ratio of plant parasites/herbivores to predators showed a unity or close to unity thus, indicating towards a balanced type of ecosystem. The fair representation of the second degree consumers or so called carnivores/predators, in the soil environment, was detrimental to the population build of the smaller nematodes or plant parasites and a balance was always maintained.

Beside plant parasites, the non parasitic species that preferred the root zone of *Acacia nilotica* are *Eucephalobus oxyuroides*, *Oigolaimella indica*. sp. n. which presumably rely upon the bacterial colonies that grow on the root exudates and root leachates. Some other bacterivores viz., *Tylocephalus aprimitivus* sp. n., *Oscheius keethamensis* sp. n. etc. found in the vicinity, showed phoretic association with insects that depend on the plants in one way or other.

Among the predators, the genera *Mylonchulus hawaiensis* and *Discolaimus similis* were the dominant ones and also been reported with absolute abundance in stable and structured ecosystems by Beier and Traunspurger (2003a, b), Jacobs (1987) and Nuss (1984). The numerical strength of predators outnumbering any group in Zone A reflects the abundance of prey and subsequently the food resources. Another species *Chronogaster glandulata* reflecting inability to propagate in moisture stress was found in large numbers in the Zone A where water was available perinneally.

Although with diverse characteristics of substrate the three zones showed similarity in having low representation of fungivores in the wetland population specifically in Zones B and C. Thus, their low frequency may be attributed to the low moisture levels of the zone, as fungi require significantly warm but humid conditions for growth. Thus, fungivores with their low prevalence and abundance seemed to
contribute least to the total nematode community/food web interactions and also to the decomposition pathway.

The relative abundance of bacterial and fungal feeders (Twinn, 1974; Wasilewska, 1979; Freckman and Ettema, 1993) indicated towards the decomposition pathways or channels in an ecosystem, also an important factor for assessing the productivity of soils (Yeates, 2003). In the present study, bacteria seemed to constitute the major food resources for these subterranean organisms with nematode channel ratio calculated to be >0.50. The bacterial decomposition pathway appears to be the dominant pathway in Zone C followed by Zone B and Zone A. An increased bacteriovores’ diversity probably was due to high diversity of microbes and thus reflected the nature and quality of soil environment (Standing et al., 2006) and was indicative of the fact that Lake habitat showed predominant bacterial-based energy channels of decomposition thus further confirming the results of Bardget et al. (2001).

The various indices calculated during the study also revealed high diversity and species richness, the attributes of a stable and undisturbed environment. The average Plant Parasitic Index (PPI) was found to be >2 reflecting the dominance of the ectoparasites of c-p value 3 or higher. The MI of the wetland was also > 2 in all zones showing the undisturbed status of habitat, which is apparently free from perturbations or pollution (Zullini, 1976). The contribution of the persisters in enhancing the maturity and structuredness of the ecosystem is well evident from the correlation graphs. Colonizers of c-p value 2 are the key components for the resilience and continuity of any ecosystem as they operate in conditions of moderate enrichment often supplemented with moisture stress.

The overall integration of the nematode community structure with the soil elemental composition may give a faint picture of the substrate type. By and large the wetland Keetham Lake was found to be undisturbed and stable habitat. However, presence of negligible concentration of heavy metals only in specific zones cannot be overlooked but should be taken with utmost caution. The heavy metals viz., Lead (Pb), Arsenic (As), Cadmium (Cd) and Zinc (Zn) were largely found to be in relatively greater concentration in Zone C that has been the restricted entry zone. The zone, also called as python zone showed abundance of predators. Hence in such unaltered ecosystem the death and decay of the organisms would add to the soil various elements and compounds. The heavy metals and other toxicants can enter the
food chain of the wetland through some migrating species predominantly the aquatic birds of the bird sanctuary that might visit the extremely polluted Yamuna river located close by or some adjoining polluted water bodies (a good number of industrial units around); and the process of biomagnifications could have led to build up of higher concentration of these pollutants in top carnivores/ predators viz., pythons etc. The death of these predators eventually could release these chemicals to soil.

As per quadrat analysis, it can be said that of the three zones, Zone B was found to be most stable/ undisturbed and structured zone with moderate level of food resources and largely dominated by persisters. On the contrary, moderate to high level of enrichment has been reported at most sampling sites of Zone C which happened to be the restricted access zone providing habitat to most birds. It could be largely due to the disturbances caused by the mobile consumers (predominantly birds that are lodged in the zone) which also connected to other polluted habitats and were the causative agents of pollutant entry in the food chain of the wetland and their further bioaccumulation and biomagnifications. Zone A showed an intermediate position with most of the sites undisturbed except those facing excessive human encroachment. The system showed maturity with a shift towards structured status.