A rapid diversity survey of drosophilids in selected market places in Bengaluru Urban district.

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Drosophilids are common in homes, restaurants, markets and are highly sensitive to environmental variations acting as bio-indicators (Penariol *et al*., 2013). The present rapid diversity survey was undertaken in market places in Bengaluru Urban district of Karnataka, India, during summer 2014. Traditional bottle trapping method was employed for the collection of flies using banana and apple smash baits in 11 randomly selected market sites *viz*., Attur (SITE 1/S1), Yelahanka New town (S2), Yelahanka Old town (S3), Vidyaranyapura (S4), M.S. Palya (S5) in Bengaluru North Taluk and Mallathalli (S6), Nagarabhavi (S7), Padmanabhanagar (S8), Chikkalsandra (S9), Kengeri (S10), and Kathriguppe (S11) in Bengaluru South taluk. Two bottles were kept in each site and recovered after 24 hours by carefully plugging the bottle with cotton plugs. The flies in each bottle were identified using the keys (Sturtevant, 1927; Patterson and Stone, 1952; Throckmorton, 1927, 1975; Bock and Wheeler, 1972) and counted to assess the abundance of each species. Eight different *drosophilid* species belonging to two genera were identified. Seven species belonging to genus *drosophila viz., D. rajashekari, D. malerkotliana, D. melanogaster, D .nausuta, D. neonausuta, D. takahashii, D. bipictinata,* and a species under genus *Phorticella* (*P. straita*) were identified. Attur and Kengeri recorded maximum number of species, *i.e*., five, and Kathriguppe recorded the lowest with just two species (Table 1). Biodiversity indices were calculated using PAST ver. 3.0 (Hammer *et al*., 2001). Attur, Yelahanka old town, Nagarabhavi and Kengeri showed higher diversity (Table 2) in comparison to other locations during the study period.

Table 1. Number of individual flies counted from traps in each location.

		Sites of collection											Total number of flies
		Bengaluru North taluk					Bengaluru South taluk						
Sl. no	Species	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	
1	*D. rajashekari*	+	-	-	-	+	-	+	+	-	+	-	7
2	*D. malerkotliana*	+	+	+	-	-	+	+	+	+	-	-	14
3	*D. melanogaster*	+	+	+	-	+	+	+	+	-	+	+	24
4	*D. bipectinata*	+	-	-	-	-	+	-	+	-	-	-	3
5	*D. nasuta*	-	+	+	+	+	-	-	-	-	+	-	5
6	*D. takahashii*	-	-	-	+	-	-	+	-	+	-	+	14
7	*D. neonasuta*	-	-	-	-	-	-	-	-	-	+	-	1
8	*P. striata*	+	-	+	+	-	-	-	-	+	+	-	21

+ = recorded and - = not recorded

The present study is the first of its kind undertaken in Bengaluru city revealed different *Drosophilids* dwelling in market areas with dense human presence and movement. The markets in selected sites are found to be favorable breeding grounds for drosophilids and other scavenger fauna. Movement of market goods between markets, market and residences, and so forth, would enable flies to gain access to different areas facilitating species dispersal and heterogeneous assemblages of populations of different *Drosophila* species.

D. melanogaster was recorded in 9 locations followed by *D. malerkotliana* (7) > *D. rajashekari* and *P. striata* (5) > *D. takahashii* (4) > *D. bipectinata* (3) > *D. neonasuta* (1 in Kengeri). Interestingly this is the first record of *P. striata* in the study area and it was found to occur in large proportions followed by *D. melanogaster*. Considering their role in scavenging and as bioindicators, long term research on urban populations of *Drosophilids* needs to be undertaken for better understanding of their spatio-temporal distribution in urban areas, their diversified ecological roles as well to aid in conservatory measures.

Table 2. Diversity indices of heterogenous assemblages of drosophilid species in different areas.

	Sites of collection										
Alpha diversity indices	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11
Taxa_S	5.0	3.0	4.0	3.0	3.0	3.0	4.0	4.0	3.0	5.0	2.0
Individuals	15.0	6.0	4.0	13.0	5.0	4.0	5.0	10.0	4.0	16.0	7.0
Dominance_D	0.3	0.5	0.3	0.4	0.4	0.4	0.3	0.4	0.4	0.3	0.8
Simpson_1-D	0.7	0.5	0.8	0.6	0.6	0.6	0.7	0.6	0.6	0.7	0.2
Shannon_H	1.4	0.9	1.4	0.9	1.0	1.0	1.3	1.2	1.0	1.4	0.4

References Bock, L.R, and M.R. Wheeler 1972, The *Drosophila melanogaster* species Group. University Texas Publication 7103: 273-280; Hammer, *et al*. 2001, PAST ver. 3.0; Patterson, J.T, and W.S. Stone 1952, *Evolution on the Genus* Drosophila. The MacMillan Company; Penariol, LV, Lilian Madi-Ravazzi 2013, Springerplus 2(1): 2013; Sturtevant, A.H., 1927, Phillippine and other oriental Drosophilidae, Phillippine Journal of Science 32: 1-4; Throckmorton, L.H., 1975, *In*: *Handbook of Genetics* (King, R.C., ed.). Plenum Press, New York, pp. 421-467; TaxoDros 2010, The database on taxonomy of Drosophilidae; Throckmorton, L.M., 1927, The problem of phylogeny in the genus *Drosophila*. University of Texas Publication 6205: 207-374.

Electrophoretic variants of esterase in two closely related species of *Drosophila: D. bipectinata* and *D. malerkotliana.*

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Bock and Wheeler (1972) very vividly described the phylogenetic relationships among the four species of *Drosophila bipectinata* species complex. Their explanation on this complex fascinated a number of workers to elucidate the evolutionary relationships among the four species of this complex by employing cytological and molecular investigations. These four closely related and morphologically quite similar species are *D. bipectinata, D. parabipectinata, D. malerkotliana,* and *D. pseudoananassae*. This complex is part of the *ananassae* subgroup of the *melanogaster* species group (Bock and Wheeler, 1972). The two species of this complex, *i.e*., *D. bipectinata* and *D. malerkotliana*, are sympatric over most of their geographic distributions. Under the laboratory conditions, these two species are crossable and produce hybrids whose females are fertile but males are sterile (Gupta *et al*., 1980).

Studies with regard to electrophoretic variants of enzymes have been one of the interesting aspects for *Drosophila* workers (Ayala and Powell, 1972; Ayala, 1975; Ayala *et al.*, 1974; Prakash, 1977; Mulley *et al.*, 1979; Cavener and Clegg, 1981; Santos *et al.*, 1989; Prout and Barker, 1993; Moraes and Sene, 2002; Kumar and Singh, 2014). Many polymorphic enzyme loci have been depicted from the natural populations of *Drosophila*. Esterase enzyme is known to be represented by more than one locus in a number of species of *Drosophila*. In *D. ananassae*, this enzyme is represented by three distinct polymorphic loci in the natural and