First record of Drosophilids at Nandi Hills, South Karnataka, India.

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Introduction

Biodiversity is a buzz word, which is attracting the researchers to understand the diversity of biological systems. Insects are supposed to be the major contributors and comprise 80% of faunal constellation. More than 3750 different species are now recognised belonging to the family Drosophilidae (Wheeler, 1981); about one-third (1048) of these species have been newly described since the publication of Wheelers catalogue (Wheeler, 1986). The Indian subcontinent, with its subtropical climate and varied physiographic conditions, including variable altitudes and luxuriant flora, offers an abode for the rich and wide distribution of *Drosophila* fauna. During recent years, considerable data have been accumulated regarding faunal composition of Drosophilid species as a result of extensive field collections in different ecological habitat by Ayala (1970a). The Drosophilid flies thus obtained have been utilized for various studies, namely: taxonomic, ecological, genetical, behavioral, and its distribution. A better understanding of how different species are affected by current climates and why they sometimes respond differently to climate change is necessary for predicting future effects of climate change (Weatherhead, 2005). In view of this, this first record surveys Drosophilid fauna distributed in Nandi Hills, South Karnataka, India during 2012 at variable altitudes and to record the impact of seasonal stress on Drosophilid composition.

Materials and Methods

Chikkaballapur District - The collection was made from Nandi hills located just 10 km from Chikkaballapur town and approximately 60 km from the city of Bangalore, Karnataka, India. The hill is visible as a compact block of three rocky outcrops, one of them, Nandidurg, raising some 1478 m. It lies between 12º 53' N – 78º 12' E and is 4,851 ft above sea level. It consists of semi evergreen forest with Nilgiri plantations. An investigation has been presented for different seasons at three altitudes (901 m, 1093 m and 1395 m).

At 901 m: The foot of the hill was occupied with *Magnifera Indica* along with trees such as *Acacia concinna, Acacia catechu, Anacardium occidentale, Vitis ripari, Ficus religosa, Ficus bengalensis, Pongamia glabra, Tectona grandis, Phyllanthus* species and many shrubs including cactus. At 1093 m: The most commonly found are *Andrographis serpelliflolia, Lantana camera, Zizipus jujube, Vitex negundo*. At 1395 m: At the top of the hill includes *Acacia catechu, Vitex negundo, Ficus religosa, Autocarpus integrifolia, Anacardium occidentale, Zizipus jujube.*

Collection procedure

Both bottle trapping and net sweeping methods were used. For bottle trapping, milk bottles of 250 ml capacity containing smashed ripe bananas sprayed with yeast were tied to the twigs underneath to small bushes and trees. Five bottles were kept at each altitude. The following day the mouth of the bottle was plugged with cotton and brought to the laboratory. These flies that were collected in the bottles were transferred to the fresh bottles containing cream of wheat agar medium as food. Net sweeping was also done for collecting the flies using banana rotting fruits with equal quantity of approximately 250 g, which were placed beneath the shaded areas of trees and bushes one day before collection. Such bait as fermenting fruits retains its attractive odor for a long time. The collections were made early in the morning by sweeping in each trap at least three times and transferring samples to six quarter milk bottles filled with standard agar medium sprayed with yeast. Likewise from each collection spot, the flies were collected in ten bottles. Then the traps were brought to the laboratory, flies were isolated, counted, and categorized. The species identification was made according to taxonomic

groups by employing several keys of Sturtevant (1927), Patterson and Stone (1952), Throckmorton (1927), and Bock and Wheeler (1972). The study was conducted during the months of May, August, and December.

Table 1. *Drosophila* collected at the different seasons of Nandi Hills (2012).

Species	Summer A	Rainy A	Winter A
D. melanogaster	133	105	81
D. malerkotliana	65	74	72
D. simulans	136	65	102
D. elegans	1	4	1
D. eugracilis	3	3	0
D. nagarholensis	43	56	6
D. rajashekari	135	72	41
D. bipectinata	76	131	44
D. n. nasuta	67	222	40
D. s. neonasuta	46	148	33
Phorticella striata	46	91	80
D. varietas	6	7	2
Total	757	978	502

Results

The total number of flies recorded at Nandi Hills during 2012 was 2237 with diversified species (Table 1), of which the number of flies observed was higher during rainy season with 978 flies, followed by summer with 757 flies, and winter with 502 flies, respectively.

Of the species recorded, frequency of *D. simulans* was more abundant with 136 flies and the least observed was *D. elegans* with only 1 fly during summer. The density of the species during summer is as follows (Figure 1 a): D. sim > D. raj > D. mel > D. bip > D. nas > D. mal > D. neo > P. str > D. nag > D. var > D. eug > D.ele. In case of rainy season, more flies were observed in *D. n. nasuta* with 222 flies and least in *D. eugracilis* with 3 flies. The density of the species during rainy is as follows: (Figure 1 b): D. nas > D. neo > D. bip > D. mel > P. str > D. mal > D. raj > D. sim > D. nag > D. var > D. ele > D. eug. During winter, more were seen in *D. simulans* with 102 flies and least in *D. elegans* with only 1 fly. *D. eugacilis* was not found during this season. The density of the species during winter is as follows (Figure 1 c): D. sim > D. mel > P. str > D. mal > D. bip > D. raj > D. nas > D. neo >D. nag > D. var > D. ele.

More flies were collected in the mid altitudes during all the seasons of the year with slight variations in the case of *D. rajashekari, D. s. neonasuta,* and *D. simulans* in the high altitudes during summer, rainy, and winter season, respectively.

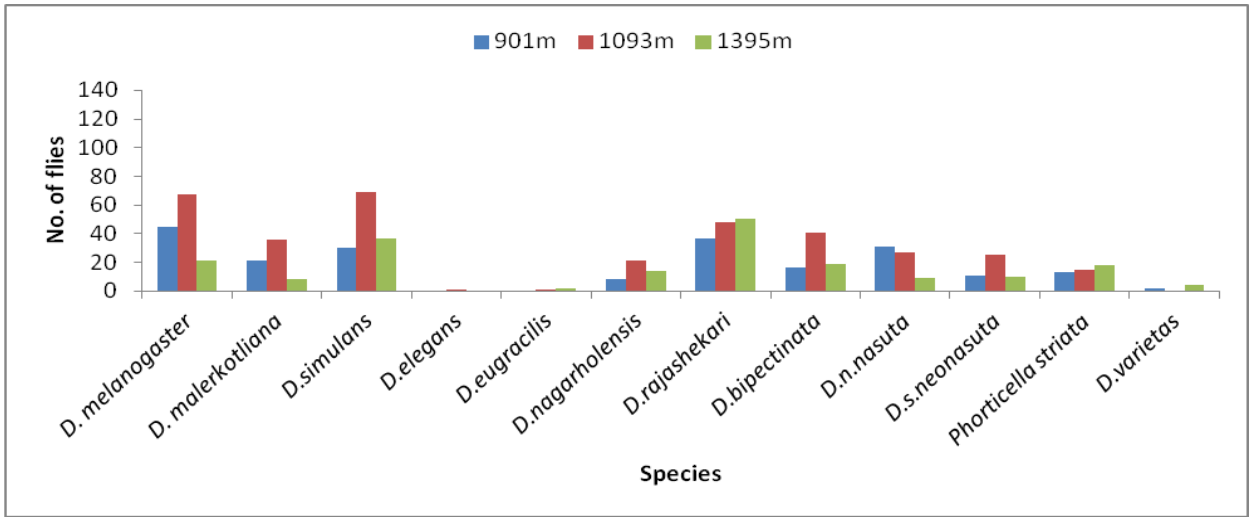

Figure 1 a. Population density of *Drosophila* at different altitudes of Nandi hills (2012) during summer season.

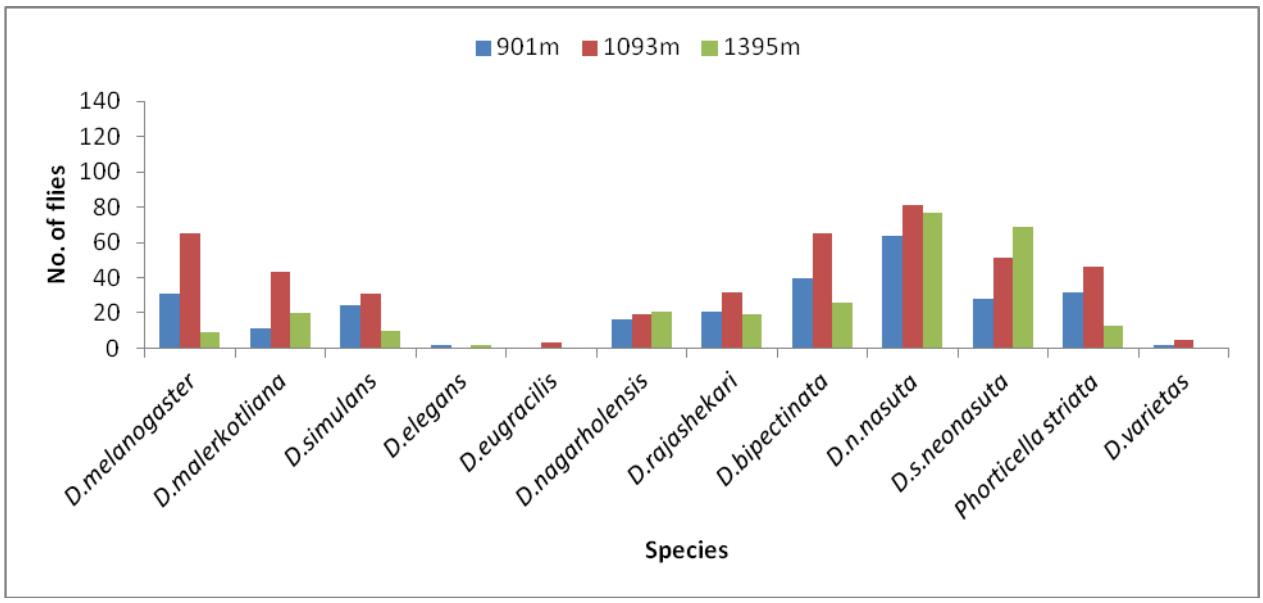

Figure 1 b. Population density of *Drosophila* at different altitudes of Nandi hills (2012) during rainy season.

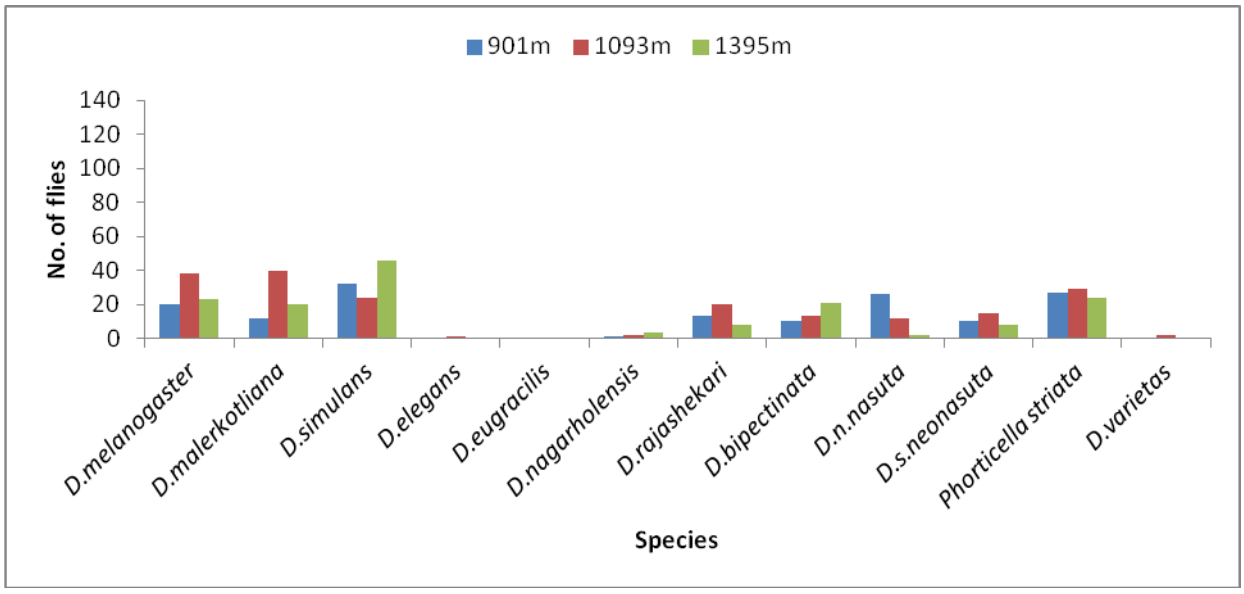

Figure 1 c. Population density of *Drosophila* at different altitudes of Nandi hills (2012) during winter season.

A total of 12 species were found in Nandi Hills (Table 1). Interestingly, the number of *Drosophila* flies decreased with increasing altitude, which indicates that the *Drosophila* community is affected by elevation (Guruprasad, 2006). In addition to this, the abundance of *Drosophila* collected at different altitudes was also recorded to observe species richness and their abundance at various altitudes. *D. melanogaster, D. simulans, Phorticella striata, D. s. neonasuta, and D. n. nasuta* could be assigned as dominant species as they were available at all the altitudes, although the collection of the flies were more in rainy, lesser in winter, and intermediate in summer season. With respect to the vegetation, at the middle region more number of flies were collected, which is proportional to the vegetation, when compared to the other altitudes region.

References: Ayala, F.J., 1970, New York. pp. 121-158; Guruprasad, B.R., and S.N. Hegde 2006, Dros. Inf. Serv. 89: 10-11; 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. Bächli, G., (org). [2010 April 18]. Available from http://taxodros.unizh.ch/; Weatherhead, P.J., 2005, Oecologia 144: 168-175; Wheeler, M.R., 1981, The Drosophilidae: A taxonomic overview. In: *The Genetics and Biology of* Drosophila (Ashburner, M., H.L. Carson, and J.N. Thompson, Jr., Eds.), Academic Press, New York. 3a: 1-97; Wheeler, M.R., 1986, Additions to the catalog of the world's Drosophilidae. In: *The Genetics and Biology of* Drosophila. (Ashburner, M., H.L. Carson, and J.N. Thompson, Jr., Eds.) Academic Press, New York. 3e: 395–409.

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Green, R.L., 1998, Heredity 121: 430-442.

Waters, R.L., J.T. Smith, and R.R. Brown 1990, J. Genet. 47: 123-134.

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