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Studies on *Drosophila* biodiversity of Harangi Forest: Coorg District, Karnataka.

Guru Prasad, B.R.*, and Pankaj Pathak. *Kannada Bharthi College, Kushalnagar, Madikeri, Karnataka, India; J.S.S. Ayurvedic College, Mysore, Karnataka, India; Email: gurup2006@yahoo.co.in.

Drosophila has been used as a model organism for research for almost a century. It has richly contributed to our understanding of the pattern of eco-distribution, biodiversity (Guru Prasad *et al.*, 2010), and altitudinal variation (Guru Prasad and Hegde, 2006). The studies have also been made on the population genetics of different species of this genus. The *Drosophilid* family is composed by 65 genera and more than 3500 described species that occur in a number of ecosystems all over the world (Bachli, 1998). However, various studies have been carried out in the laboratory and field by many workers. Though early studies on *Drosophila* in India were mainly concerned with taxonomy, 1970 onwards studies in other fields have also been initiated such as biodiversity. The taxonomical and population genetical studies have progressed little due to lack of interest of people in it. Although many workers feel that taxonomical work shall not be neglected, people show little interest because of the hardship during work and lack of opportunity in the field. To fill up this gap at least partially, we took this work for the study *Drosophila* population and altitudinal variation of *Drosophila* and their species diversity in give Harangi hill. Three months survey was conducted to analyze the altitudinal variation in diversity of *Drosophila* in Harangi hill of Kushalnagar, Coorg district Karnataka state, India.

To study the altitudinal variation of *Drosophila* and their community, the collection was done in the Harangi hill during June-Aug 2009. The Harangi hill is a famous tourist spot with altitude 900 meters, 8 km from the Kushalnagar City, Coorg, Karnataka, India. The altitude of the hill from the foot (base) is 500 meters, the temperature ranges from 16°C to 35°C, and relative humidity varies from 19% to 75%. The collections of flies were made during monsoon season (June to August once in 15 days of the months). For this method flies were collected by using sweeping and bottle trapping methods from the altitudes 500m, 600m, 700m, and 800m (500m base of the hill) such as lower altitude of Harangi hill. 1) Bottle trapping method, 2) Net sweeping method. In bottle trapping method regular banana baits in quarter pint 250 ml milk bottles sprayed with yeast were tied to the twigs of trees at two and half feet above the ground in cool shaded areas covered by scrubs. Next day flies were attracted by the bait and thus the bottles were collected during early morning by plugging with cotton to the mouth of the bottles.

In net sweeping methods rotting fruits are spread usually beneath shaded areas of the bushes of plantation various fruits such as *Musca paradisca* (banana), *Ananas comuses* (pineapple), *Vitis vanifera* (grape), *Artcarpus hetrophylles* (jack fruit), *Pyrus malus* (Apple), *Carica papaya* (papaya), *Arthras* (guava), and *Citrous auranthium* (lime) are mixed and used for spreading. After one day of spreading, the flies are swept using fine net. This is done in all the altitudes, 500m, 600m, and 700m, and 800m height of the hill. The flies are transferred to the bottles containing wheat cream–agar medium and then brought to the laboratory isolated, sexed, and identified according to the Texas Publication 1975 records. Then they were examined under microscopy.

Analysis of species diversity of flies collected in monsoon was assessed by Berger-Parker (1/d) indices (Mateus *et al.*, 2006). Berger-Parker index (1/d) which shows the relative abundance was calculated using the formula,

$$1/d = \frac{N}{N_{Max}}$$

Where N = Number of individuals of all species; N_{Max} = Number of individuals in the most common species.

Table 1. Showing the list of species of *Drosophila* and their numbers collected at different altitudes of Harangi hill during June-Aug 2009 (m-Meters).

Sl.No	Species	500m	600m	700m	800m	Total
Subgenus Sophophora						
1	<i>D. anomelani</i>	24	25	30	39	118
2	<i>D. coonorensis</i>	00	00	15	15	30
4	<i>D. jambulina</i>	150	209	200	200	759
5	<i>D. kikkawai</i>	11	05	03	11	30
6	<i>D. malerkotliana</i>	482	686	880	1003	3051
8	<i>D. punjabiensis</i>	32	27	33	40	132
9	<i>D. rajasekari</i>	780	740	237	236	1993
10	<i>D. suzukii</i>	16	10	09	20	55
11	<i>D. takahashii</i>	05	33	11	31	80
12	<i>D. bipectinata</i>	260	180	150	142	732
Total		1760	1915	1568	1737	6980
Subgenus Drosophila						
1	<i>D. nasuta</i>	901	913	1123	2017	4654
2	<i>D. neonasuta</i>	834	581	819	950	1850
3	<i>D. repleta</i>	95	96	61	74	326
4	<i>D. immigrans</i>	00	00	96	154	250
Total		1830	1590	2099	3195	7080
Subgenus Dorsilopha						
1	<i>D. buskii</i>	145	136	111	127	519
Total		145	136	111	127	519
Subgenus Scaptodrosophila						
1	<i>D. brindavani</i>	470	570	564	783	2387
2	<i>D. nigra</i>	200	204	289	309	1002
3	<i>D. mundagensis</i>	70	80	79	89	318
Total		740	854	932	1181	3707
Total		4475	4495	4710	6240	19920
1	Berger-Parker index	1.109	1.051	1.036	1.023	

The results of our *Drosophila* survey are shown in Table 1. This table shows as altitude increases there was an increase in number of *Drosophila* species. Totally 19,920 flies were encountered during the collection, which belong to four subgenera, namely *Sophophora*, *Drosophila*, *Dorsilopha*, *Scaptodrosophila* with twenty species. The 500m altitude comprises 4475, 600m (4495); 700m (4710); and 800m (6240) of *Drosophila* in numbers. The *Sophophora* comprises more

numbers of flies and species in the caught compared to other genera. The subgenus *Dorsilopha* is least in the number and as well as species. *D. nasuta* and *D. malerkotilana* species are the common species found in the hill and all the altitudes. So this is regarded as the common and abundant species in the hill. Another most important finding is all species were not found in all altitudes, and *D. nasuta*, *D. neonasuta*, *D. malerkotiana*, *D. rajasekari*, *D. jambulina*, and *D. bipectinata* were common species found in all altitudes. There are some species such as *D. coonorensis*, *D. suzuki*, *D. immigrans* found only in one or two altitudes. The community and biodiversity was big in higher altitude compared to lower altitudes. These results are entirely reverse to our own studies in Chamundi hill during 2007 (Guru Prasad and Hegde, 2006). These results were due to micro and macro climatic conditions, which are different from the location to other locations. The highest number and species of flies were found in 800m altitude with numbers. Further our intention is not only to study the taxonomy of *Drosophila*, but also the biodiversity using the index called Berger-Parker. The result of the Berger-Parker index according to the altitude was depicted in Table 1, where it shows the lower number in higher altitude (800m).

According to Ludwig and Reynold (1988), the greater the value of $1/d$, the lower is the diversity. Application of these indices to the collection data of different altitudes of hill demonstrates that higher altitude of 800 m with lower value of $1/d$ has higher biodiversity than other altitudes (Table 1). This may be more easily understood if we observe the quantity and dominance of each species in each altitude, since the index combines two functions: number of species and uniformity, *i.e.*, the number of individuals present in each species (Ludwig and Reynold, 1988; Torres and Ravazzi, 2006). Thus, from the present eco-distributional and population analysis of *Drosophila* in hill, it is clear that the distributional pattern of a species or related group of species is uneven in space and time. *D. malerkotiana* and *D. nasuta* emerged as champion species, as they are registered in all altitudes. *D. immigrans* is completely absent in the lower altitudes. In a nutshell, it can be said that the *Drosophila* community of hill is highly diverse and depends on several environmental factors like flora, which provides the habitat for flies in addition to the genetic structure of the species present in it.

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Analysis of inversion polymorphism and new inversion recorded in *Drosophila polymorpha* in the South of Florianopolis, Santa Catarina, Brazil.

Wildemann, B., and D.C. De Toni. Departamento de Biologia Celular, Embriologia e Genética, Universidade Federal de Santa Catarina, Florianópolis, Brasil; brunawild@yahoo.com.br; detoni@ccb.ufsc.br.

Drosophila polymorpha, described by Dobzhansky and Pavan (1943), belongs to the *cardini* group within the genus *Drosophila*. Species of this group inhabit different areas of Neotropical America. In Brazil, *D. polymorpha* has reports of a wider distribution in the Southeast (Da Cunha *et al.*, 1953), while in the south of the island of Santa Catarina, taxonomic studies of *Drosophila* communities consider this to be one of the species most often found (De Toni and Hoffmann, 1994).