



Fluctuation of *D. kikkawai* population in Hegdekatta village, Sirsi taluk, India with a preliminary report on its sex comb patterns.

Srinath, B.S., and N. Shivanna*. Dept. of Zoology, Karnatak University, Dharwad-580003. *Corresponding author: drnshivanna@rediffmail.com

Abstract

Drosophila flies were collected from areca plantations of Hegdekatta village, Sirsi taluk, Uttara Kannada District. It revealed a total of 7019 flies comprising of 12 species during 2012 to 2014. *D. kikkawai* Burla 1954, species population fluctuated with respect to areca harvesting period when compared to other species at different seasons. Sex comb teeth and comb pattern variation was observed for the first time in the males of *D. kikkawai* species in either first or second or in both the combs of first and second tarsal segments.

Introduction

Fluctuation of a species population in a locality/ region may be attributed to many factors such as seasons, temperature, rainfall, humidity, dark – light duration, fruiting plants, and so on (Parsons and Bock, 1979). *Drosophila* flies are constantly used as one of the model organisms in the studies of ecology and biodiversity (Parsons, 1973; Hegde *et al.*, 2001; Markow and O' Grady, 2006). Biodiversity of *Drosophila* till now has revealed a total of 4217 Drosophilids all over the world, which includes 1178 species belonging to genus *Drosophila* (Bachli, 2014). Seasonal studies on *Drosophila* are well documented from different parts of the world (Dobzhansky and Pavan, 1950; Paik, 1957; Wakahama, 1961; Torres and Madi-Ravazzi, 2006), and others. In North India, Parshad and Paika (1964) have studied seasonal variation of *Drosophila* from Punjab. Similarly in South India such studies are well documented from surrounding localities of Mysore (Reddy and Krishnamurthy, 1974; Prakash and Reddy, 1978; Guruprasad and Hegde, 2006; Prakash and Ramachandra, 2008; Guruprasad *et al.*, 2010). In North Karnataka seasonal variation of *Drosophila* is known only from Dharwad District (Srinath and Shivanna, 2014). Variation among particular *Drosophila* species to particular habitat/ locality/ fruiting season is not very well known, though the effects of geographical location, season, species of host plant, and climatic factors on abundance have been studied (Barker *et al.*, 2005). Recently Srinath and Shivanna (2013) studied fluctuation of *Phorticella striata* populations from mango plantations of Dharwad District. *D. kikkawai* is a species belonging to the *kikkawai* species complex of *montium* subgroup categorized under *melanogaster* species group. This species is distributed in parts of Oriental and Neotropical region, females have both dark and light colored abdominal tip in a single population and it is known for color polymorphism (Bock and Wheeler, 1972; Gibert *et al.*, 1999). The variation in male genitalia was also reported (Burla, 1956). The studies on variation of population and other morphological characters were not analysed in this species. In view of this, the present study on above aspects was analysed using *D. kikkawai* in areca plantation.

Materials and Methods

Drosophila flies were collected in areca plantation (*Areca catechu*) of Hegdekatta village, Sirsi taluk during different months from 2012 to 2014 using bottle trapping and net sweeping methods. In bottle trapping method, 250 ml capacity bottles containing about 1 cm of smashed over-ripened banana fruit sprayed with yeast were tied to the twigs of trees near areca plants about 2½ feet above the ground. Bottles were collected after 48 hours by plugging the mouth with cotton. Net sweeping method: the flies were collected directly by sweeping over the areca fruits which were pooled on the ground and were transferred to fresh media bottles containing wheat cream agar medium prepared as per the procedure of Shivanna *et al.* (1996). The bottles were brought to the laboratory, flies were separated according to sex. and species were identified using the

keys as described by Parshad and Paika (1964), Bock and Wheeler (1972), and Markow and O' Grady (2006). For sex comb studies *D. kikkawai* male flies were etherized and forelegs were removed from the bases of the fly and transferred to a transparent glass slide containing a drop of DPX and mounted with a cover glass and observed under microscope. The patterns of teeth arrangement in sex comb were photographed.

Results and Discussion

A total of 7019 individual flies comprising of 12 species were collected during 2012 to 2014 in areca plantation of Hegdekatta. Figure 1 revealed population fluctuations of 12 species of *Drosophila* in different seasons. *D. n. nasuta*, *D. s. neonasuta*, *D. malerkotliana*, and *D. bipectinata* are dominant species in all the seasons. *D. kikkawai* is not a dominant species in any seasons during 2012 to 2014; it shows dominance only during areca fruiting season. Its dominance is more than the dominant species during other seasons. In 2012 the total number of flies collected is 943 comprising of 7 species, out of which 42% of flies belong to *D. kikkawai*. It amounts to 48% and 43% in 2013 and 2014, respectively. Whereas its percentage in other seasons is 0.05%, 2%; 6%, 3%; and 5%, 2% during summer and monsoon in 2012; 2013 and 2014, respectively. Figure 2 shows the sex combs of *D. kikkawai* collected from areca plantations; it revealed variation in sex comb pattern of male flies in both tarsal segments. These variations were found either in the first or second or in both the sex combs.

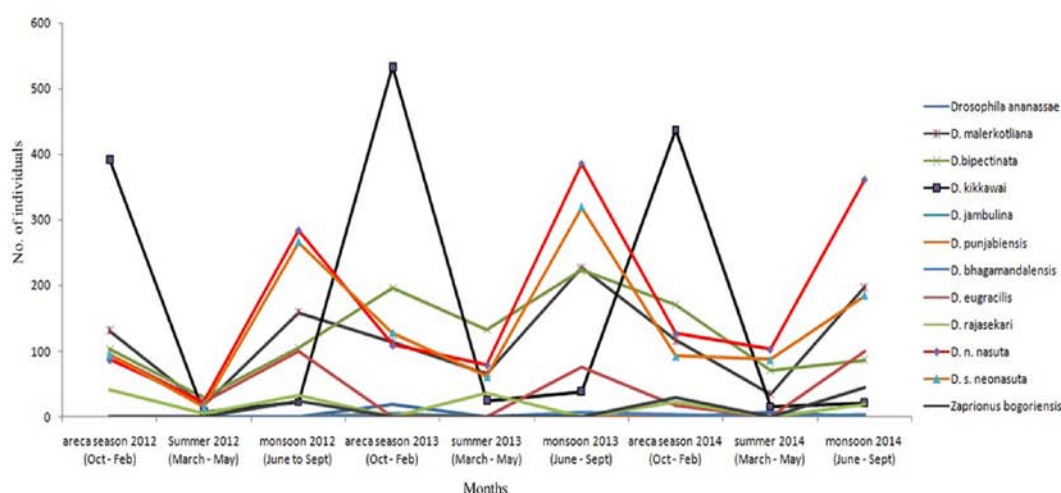


Figure 1. *Drosophila* species and their number of flies collected in different seasons during 2012-14 from Hegdekatta.

Areca catechu, which is the major commercial crop in Uttara Kannada district, is grown in an area of approximately 5115 ha (Bhat, 2013). The harvesting season of this crop starts from October to February; during this period maximum yield is obtained. The population of *D. kikkawai* was found maximum in this plantation during the harvesting period of areca fruit compared to other species. Later in summer there is drastic decline in its population and in monsoon other species, such as *D. s. neonasuta*, *D. n. nasuta*, *D. malerkotliana*, and *D. bipectinata*, are found dominant, whereas the population of *D. kikkawai* is negligible. Similar type of result was reported in *D. ananassae*, *D. hypocausta*, and *D. anuda* in a tropical wet climate (Moen Island, Truk, eastern Caroline Islands) due to the presence of fruit-trees (Parsons, 1973); also the range of species is determined by the availability of its host plant range (Barker *et al.*, 2005). In South India, generally it is known that the populations of *Drosophila* are abundant during monsoon season, which usually provides the ideal conditions for populations to thrive (Hegde *et al.*, 2001). The areca harvesting season is categorized under the post-monsoon and winter seasons. Srinath and Shivanna (2013; 2014) studied seasonal variation of *Drosophila* in Dharwad, which is adjacent/ neighbouring district of Sirsi taluk, reported that post-monsoon and winter season has less abundance when compared to monsoon; especially during winter the conditions will be dry, cold, and with a shortage of food source. It was also found that populations of

Phorticella striata were abundant during mango harvesting season (May and June), after this season the population declined drastically. The interaction among species and its environment / season shows that fluctuations in number of flies are due to variations in the surrounding microhabitats of the plantations. It could well depend upon the type of particular food on which the species survives and flourishes.

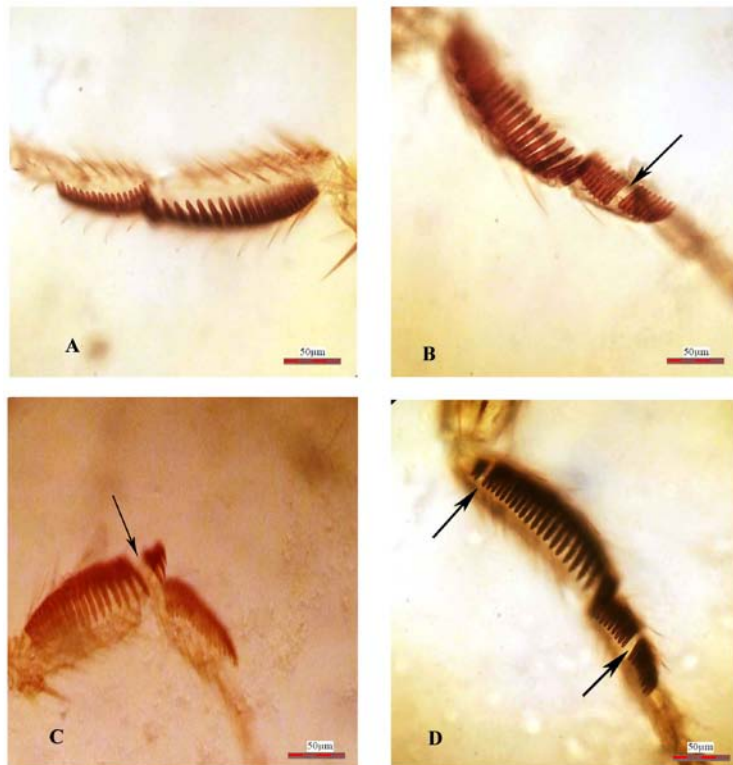


Figure 2. Sex combs of *D. kikkawai*. A, normal; B - D, variants. Arrows indicate gaps in the sex comb at first, second, and both tarsal segments.

The sex comb is one of the traits in identification of species and it is a secondary sexual character which plays an important role in sexual selection. The sex comb is one of the most rapidly evolving male - specific traits in *Drosophila* (Kopp, 2011). The variation among the sex comb in the forelegs was observed in *D. kikkawai*. Variation in number of teeth in combs of first and second tarsal segments as well as gaps was found. Ahuja and Singh (2008) reported similar type of observation in *D. melanogaster*. Sex comb teeth variation and pattern of sex combs in *D. kikkawai* species is the first report from Hegdekatta village of Sirsi. It implies that there is great amount of genetic

variation within population of this species. Further studies in this regard would help in understanding the mechanism of genetic variation and evolution.

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