A total of 1,533 flies were captured belonging to eleven different species (Table 1), of which seven species belonged to Subgenus Sophophora, three species to Subgenus Drosophila and one species to Subgenus Scaptodrosophila. *D. malerkotliana* was found to be most abundant in all three altitudes suggesting it to be dominant species as previously reported in other regions of Western Ghats (Naseerulla, 1993; Hegde, 1979; Prakash, 1979; Muniyappa, 1981; Hegde, S.N. *et al*., 2000). Variation in species and their number was seen with respect to altitude, with the highest number of flies in Low altitude (400 m) region. *D. jambulina*, *D. nigra*, and *D. nasuta* preferred lower altitudes, whereas *D. anomelani* and *D. takahashii* seemed to prefer high altitudes.

Lower value of Simpson index (Table 2) in lower altitude 400m shows rich biodiversity, whereas a decrease in diversity at 800 m is seen, followed by increase in diversity at 1,400 m. This result shows that *Drosophila* community is affected by the altitudinal variation as previously reported (Guruprasad *et al*., 2011; Wakahama, 1962; Kaushik and M.S. Krishna, 2013).

Higher density of *Drosophila* in lower altitudes can be attributed to the type of forest, where fertile top soil is eroded due to heavy rain and deposited in valleys resulting in dense vegetation, providing a suitable environment with thick vegetation at lower altitudes. Diverse species of flowering and fruit bearing flora provide resources for feeding and ovipositioning (Brncic *et al*., 1985).

Table 2. Diversity index of *Drosophila* population collected at different altitudes in Kudremukh.

Altitude	Simpson index (D)
400 m	0.1512
800 m	0.1784
1,400 m	0.1566

(Simpson Index, D = Σn (n-1) / N (N-1). Where, n = the total number of organisms of a particular species and N = the total number of organisms of all populations).

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Suppressed double crossovers in *D. pseudoobscura* inversion heterozygotes.

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Chromosomal inversions play a large role in speciation by limiting gene flow at loci within inversions through inhibiting meiotic recombination in inversion heterozygotes. In this way, inversions are thought to help maintain hybridizing species that would otherwise homogenize. Gene exchange can still occur between heterokaryotypes through a double crossover event. However, double crossovers in inversion heterozygotes occur at rates far lower than expected based on what is observed in homokaryotypes (*e.g*., Roberts,1976; Pergueroles *et al*., 2010). For example, Stevison *et al*. (2011) observed that double crossovers within the XR inversion occurred at a rate of 1 in 9739 offspring for the interspecies cross between *Drosophila pseudoobscura* and *D. persimilis*. This inhibition of recombination by the inversion may have been greater than normal because it occurred in hybrids of an interspecies cross. A natural extension of this work would be to examine the suppressive power of a comparable inversion within species. Levine (1956) noted strong suppression in *D. pseudoobscura* inversion females heterozygous for the Standard (ST) and Pikes Peak (PP) inversions, but his marker locations were not known with respect to the inversion breakpoints because of the absence of an assembled genome sequence. I sought to repeat this ST/PP cross using markers that have been mapped to the genome sequence assembly (Richards *et al.*, 2005).

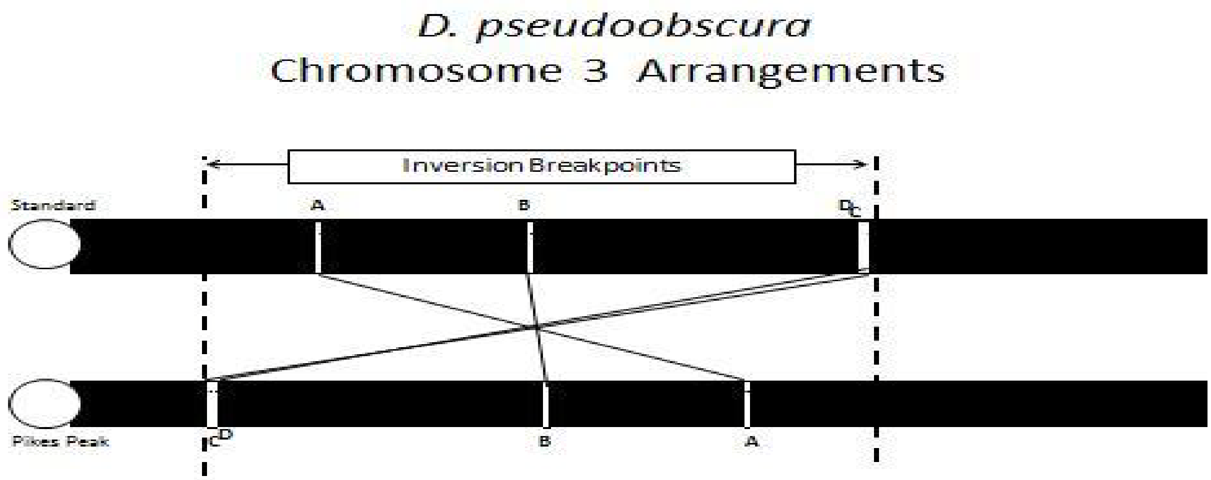

Figure 1.

Table 1. Primer sequences used for markers genotyped.

Marker A:	F: CCTTCTCCAGCGAGCAAT	R: TGTAAATATTTTGGTGCAAATATGA
Marker B:	F: TAATTTAAGCTGTTCGTCCACCGG	R: GTCTCGCTGGACATGTGATCC
Marker C:	F: ATTTCATACCGTTCCAG	R: CCGTTGATGCAGCGCTATTTT
Marker D:	F: CTTTCTGCCGCCATTTTG	R: TGGTTCTGTGCGACTGCGAT

I crossed males from a strain of *D. pseudoobscura* with the ST arrangement (Mount Saint Helena, California, strain #177, UC San Diego Stock Ctr. #14011-0121.246) to females from strain with the PP arrangement (San Antonio, New Mexico, strain #1137, UC San Diego Stock Ctr. #14011-0121.199) at 20C. I collected F_1 females and backcrossed them to PP strain males. I then genotyped the progeny (N = 3062) at four microsatellite loci (Table 1) spanning the ~6.5 megabase inversion on chromosome 3 (Figure 1).

Despite the large number of offspring surveyed, I observed no double crossover events in the test cross (0 in 3062 offspring). All offspring had the same genotype across all 4 loci. This result is very consistent with Levine's observation of a double crossover rate of 1 in 6105 offspring for ST/PP inversion heterozygotes and suggests the suppression of recombination observed by Stevison *et al.* (2011) was not unique to hybrids. From these data, I confirm the suppressive power of chromosomal inversions on double crossovers and, therefore, potentially on gene flow within and between species in inversion heterozygotes.

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Spotted Wing Drosophila, *Drosophila suzukii* (Matsumura) (Dip.: Drosophilidae), an invasive fruit pest new to the Middle East and Iran.

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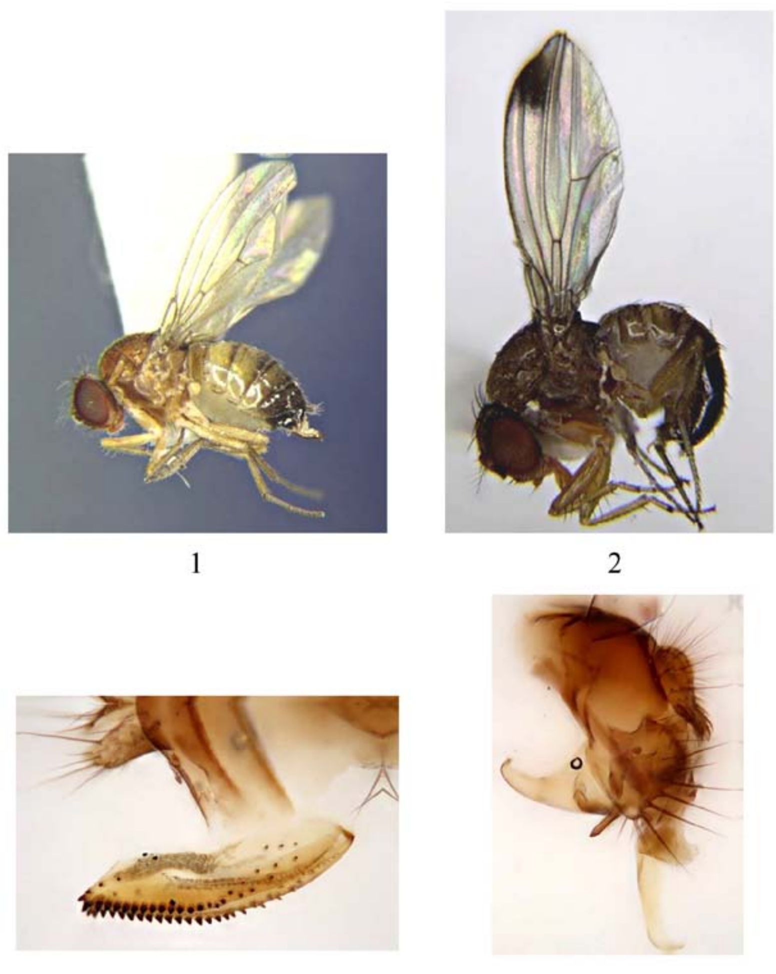
Abstract

In the course of monitoring the olive fruit fly, *Bactrocera oleae* (Gmelin), we spotted the specimens of *Drosophila suzukii* (Matsumura) in our hydrolyzed protein-baited traps placed in the olive groves located on the southern slopes of Elburz Mountains, Iran. This species is a new record for the Iranian insect fauna. The discovery of *D. suzukii* in Iran indicates that this species has already expanded its territory into the Middle East region for the first time.

Introduction

The highly polyphagous species *Drosophila suzukii* (Matsumura, 1931), commonly known as spotted wing drosophila (Figures 2, 4), attacks a wide range of fruits such as apple, apricot, blackberry, blueberry, cherry, fig, grape, mulberry, nectarine, peach, pear, persimmon, plum, raspberry, and strawberry (Cabi, 2015). Unlike most of drosophilids, the females of *D. suzukii* are able to attack undamaged fruits and insert their eggs in the fruit tissues with the help of their spectacular saw-like ovipositors (Figures 1, 3). The species has been reported from Europe, New World, Oriental region and southeastern Asia (Cini *et al*., 2012).



1 2 3 4

Figures 1-4. *Drosophila suzukii* (Matsumura) from Iran. 1, adult female; 2, adult male; 3, female saw-like ovipositor; 4, male terminali.