

Density and sex ratio of seven spotted ladybird (*Coccinella septempunctata*) in three altitudes of Khorramabad district

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Abstract: Frequencies of seven spotted ladybird (*C. septempunctata*) were sampled from three altitudes of; 1700, 1800 and 1900 meters above sea level in the Rieg-sefid region of the Khorramabad district of Iran (33°48'N, 48°57'E, 1638m) in 2009 and 2010 during summer and autumn seasons. There was a higher frequency of females than males at all three altitudes (1700, 1800 and 1900 m) in both years. The average ratio of females to males in 2009 at an altitude of 1700 meters above sea level was 1.53:1; at the altitude of 1800 m it was 1.54:1 and at the altitude of 1900 m it was 1.55:1. The average ratio of females to males in 2010 at an altitude of 1700 meters above sea level was 1.49:1, at an altitude of 1800 m it was 1.51:1 and at an altitude of 1900 m it was 1.54:1. According to this information, results demonstrated that the ratio of females to males in seven spotted ladybird species increased at higher altitude. It was also observed that populations of this ladybird in farms at high altitude decreased and increased according to season.

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1. Introduction

The seven spotted ladybird (*C. septempunctata*) is one of the most important predators of aphids. At the adult stage and during its immature stage (larval) the ladybird feeds on aphids and damages insect populations (Nunez-Perez et al., 1992; Sarwar & Saqib, 2010). This ladybird is found throughout most regions of Iran and it has been reported in all types of ecosystems (Sadeghi, 1991; Montazeri and Mossadegh, 1995; Ghahari et al., 2004; Farahi and Sadeghi namghi, 2009; Ansari pour, 2010; Ansari pour & Shakarami, 2011). This ladybird is the most dominant species in farms, gardens, mountains, pastures and meadows in the Khorramabad district (Ansari pour, 2010). The ladybird species is one that migrates. It covers short distances in search of food and this relocation involves short flights in search of food and longer flights for resettlement that includes gathering in places (Sadeghi, 1991). The seven spotted ladybird overwinters in different habitats among the surrounding forests, windbreaker and single shrubs, it can also move to the hills and mountains to overwinter (Honek, 1989; Hodek et al., 1993; Hodek & Honek, 1996, Honek et al., 2007). Overwintering is spent as a collective rather than singly and this may increase its survival rate. Ecologists believe that life as a collective may contribute to a decreased risk of attack from predators and parasites (Sillen-Tullberg

& Leimar, 1988; Turchin & Kareiva 1989; Mooring & Hartl, 1992). Adult ladybirds hibernate en masse, sometimes in small groups but more often a group consists of several thousand insects (Honek et al., 2007). Population patterns of this ladybird species in different parts of the world show that insects migrate to high altitude areas for the overwinter period of hibernation (Bodenhimer, 1943; Savoiskaya, 1960; Sadeghi, 1991; Ceryngier, 2000). The population samples taken herewith showed that with increasing altitude, the ratio of female to male seven spotted ladybird's increases (Sadeghi, 1991; Ceryngier, 2000).

There is a considerable amount of research in the field on frequencies and gender ratios of the seven spotted ladybird (*C. septempunctata*) in altitude (Sadeghi, 1991; Ceryngier, 2000), but specific research has not yet been done on the species in the Khorramabad district. The seven spotted ladybird is the most important biological control agent in the Khorramabad district. Graduate studies can deepen an understanding of the biology of this ladybird and serve to increase its beneficial use in biological control programs to reduce or replace the use of agricultural pesticides. In this regard this research aims to provide a foundation for other researchers in this field.

2. Material and method

Sampling of the Seven spotted ladybird (*C. septempunctata*) was taken at three heights (33°48'N, 48°57'E, 1700m), (33°48'N, 48°57'E, 1800m), (33°48'N, 48°57'E, 1900m) from alfalfa fields from autumn to summer in 2009 and from autumn to summer in 2010 in the Rieg-sefid region of the Khorramabad district of Iran. The overwintering ladybird samples were collected from astragalus plants at different heights by hand; plants were shaken and the insects were kept in glasses containing 70% ethanol alcohol for counting and identification of numbers of male and female ladybirds in the laboratory. Exact numbers of males and females were counted and recorded in the laboratory, this work was done for four months in each year and the information obtained was recorded at each sampling at different altitudes of the Khorramabad district and sex ratios were determined thereafter.

3. Result and discussion

Results of sampling the seven spotted ladybird at three altitudes 1700, 1800 and 1900 m were as follows:

Sampling was done in the summers of 2009 and 2010 and demonstrated that populations of this species of ladybird from early summer to early autumn reduced at higher altitude. These findings are consistent with those of (Ceryngier, 2000). Research shows that in the first month of autumn this population decreases and this trend continues until winter approaches and then the ladybird population at high altitude grows. It can be said the population

reaches its maximum in late fall and at the start of winter because these insects overwinter in highland locations.

There was a gradual increase of the ladybird population in the high region of Rieg-sefid of Khorramabad district from 2009/10/17 until 2009/12/1 and the population decreased in the same period in the alfalfa field (Fig. 1) demonstrating that this ladybird migrates to high ground for the period of overwinter hibernation; this has been validated by other research (Bodenhimer, 1943; Savoiskaya, 1960; Ceryngier, 2000). This increase in the ladybird population from 2010/10/10 until 2010/12/2 and the concurrent decrease in the alfalfa field (Fig. 2) indicated that overwintering occurred at high altitude locations.

According to Fig. 3 ladybird populations can be found three altitudes above sea level (1700, 1800 and 1900 m), the frequency of females was more than that of males which has also been commented on by (Sadeghi, 1991; Ceryngier, 2000). That research showed that the average ratio of males to females was consistent at the following altitudes in 2009; at the height of 1700 meters above sea level it was 1.53; at the height of 1800 m it was 1.54:1 and at 1900 m it was 1.55:1, and records for 2010 at the three altitudes of 1700, 1800 & 1900 m were 1.49:1, 1.51:1 & 1.54:1, respectively. These figures indicate that with increasing altitude, the ratio of female to male in seven spotted ladybird increased and this result is consistent with other research. It can be concluded that with increasing altitude the number of ladybirds increases Sadeghi (1991).

Table1. Number of seven spot ladybird in three different heights and them sex ratio in 2009.

Date	1700 m				1800 m				1900 m			
	Total	Female	Male	F/M	Total	Female	Male	F/M	Total	Female	Male	F/M
2009/7/20	103	72	31	2.32	110	69	41	1.68	142	83	59	1.41
2009/8/1	95	53	42	1.26	99	59	40	2.23	117	77	40	1.93
2009/8/14	67	43	24	1.79	72	44	28	1.57	93	52	41	1.27
2009/8/25	42	23	19	1.21	52	27	25	1.08	71	45	26	1.73
2009/9/6	31	16	15	1.07	55	35	26	1.35	69	41	28	1.46
2009/9/12	25	13	12	1.08	36	21	15	1.4	53	31	22	1.41
2009/9/29	17	10	7	1.43	24	16	8	2	43	27	16	1.69
2009/10/9	13	8	5	1.6	21	12	9	1.33	30	18	12	1.5
2009/10/17	13	9	4	2.25	18	10	8	1.25	24	14	10	1.4
2009/10/24	15	9	6	1.5	16	10	6	1.67	19	12	7	1.71
2009/11/7	16	10	6	1.7	13	8	5	1.6	25	16	9	1.78
2009/11/22	33	19	14	1.36	45	27	18	1.5	70	41	29	1.41
2009/12/1	57	32	25	1.28	67	38	29	1.31	98	59	39	1.51

Table2. Number of seven spot ladybird in three different heights and them sex ratio in 2010.

Date	1700 m			1800 m			1900 m			F/M		
	Total	Female	Male	Total	Female	Male	Total	Female	Male			
2010/7/18	111	75	36	2.08	121	81	40	2.02	137	85	52	1.63
2010/8/1	101	57	44	1.29	98	55	43	1.28	117	70	47	1.49
2010/8/15	78	47	31	1.51	81	50	31	1.61	96	53	43	1.23
2010/8/27	63	35	28	1.25	68	37	31	1.19	75	47	28	1.67
2010/9/5	49	27	22	1.22	53	31	22	1.41	59	38	21	1.81
2010/9/13	33	17	16	1.06	44	25	19	1.32	47	29	18	1.61
2010/9/28	24	14	10	1.4	33	20	13	1.54	35	19	16	1.88
2010/10/10	25	13	12	1.08	31	18	13	1.38	37	22	15	1.47
2010/10/15	29	17	12	1.42	38	20	18	1.11	45	25	20	1.25
2010/10/26	34	21	13	1.61	41	25	16	1.56	50	29	21	1.38
2010/11/6	44	27	17	1.59	52	35	17	2.05	61	36	25	1.44
2010/11/23	57	34	23	1.48	67	42	25	1.68	79	48	31	1.55
2010/12/2	75	47	28	1.68	93	56	39	1.51	107	65	42	1.55

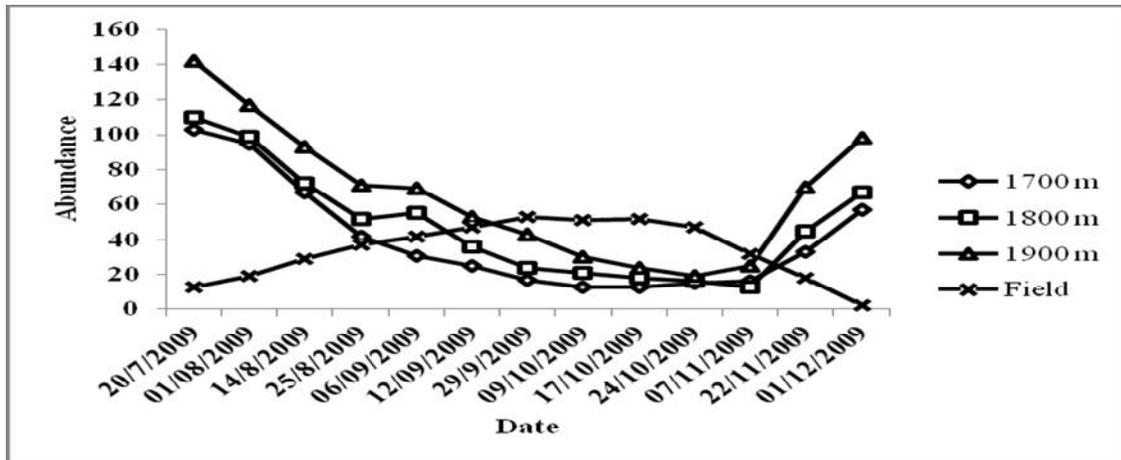


Fig1. Abundance of seven spotted ladybird (*C. septempunctata*) in three altitudes 1700, 1800 & 1900m and alfalfa field in this region from 20/7/2009 to 1/12/2009

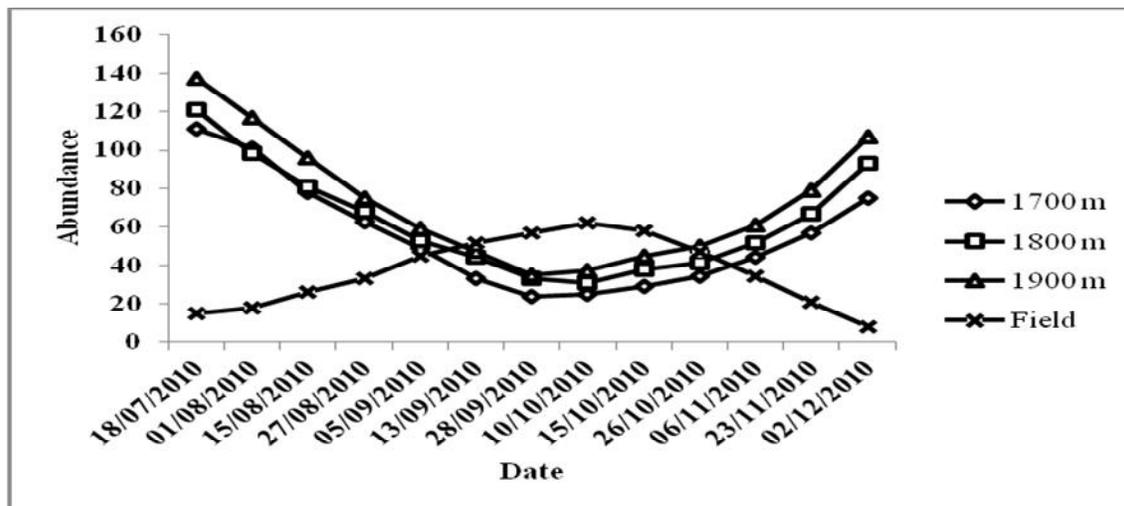


Fig2. Abundance of seven spotted ladybird (*C. septempunctata*) in three altitudes 1700, 1800 & 1900m and alfalfa field in this region from 18/7/2010 to 2/12/2010

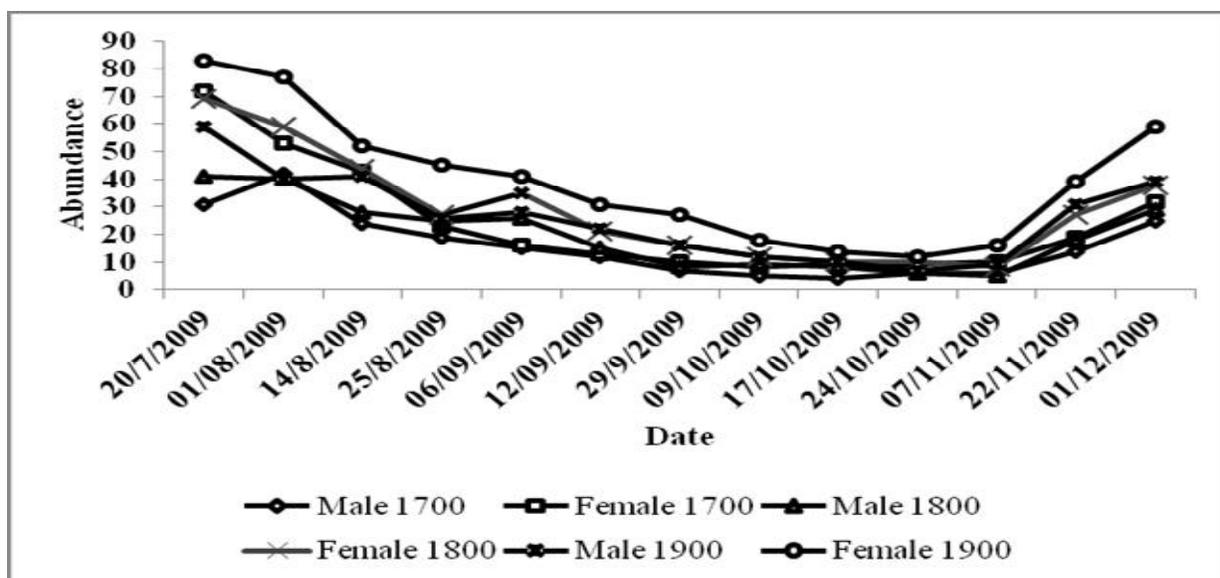


Fig3. Abundance of male and female seven spotted ladybird in three altitudes 1700, 1800 & 1900m and alfalfa field in this region from 20/7/2009 to 1/12/2009

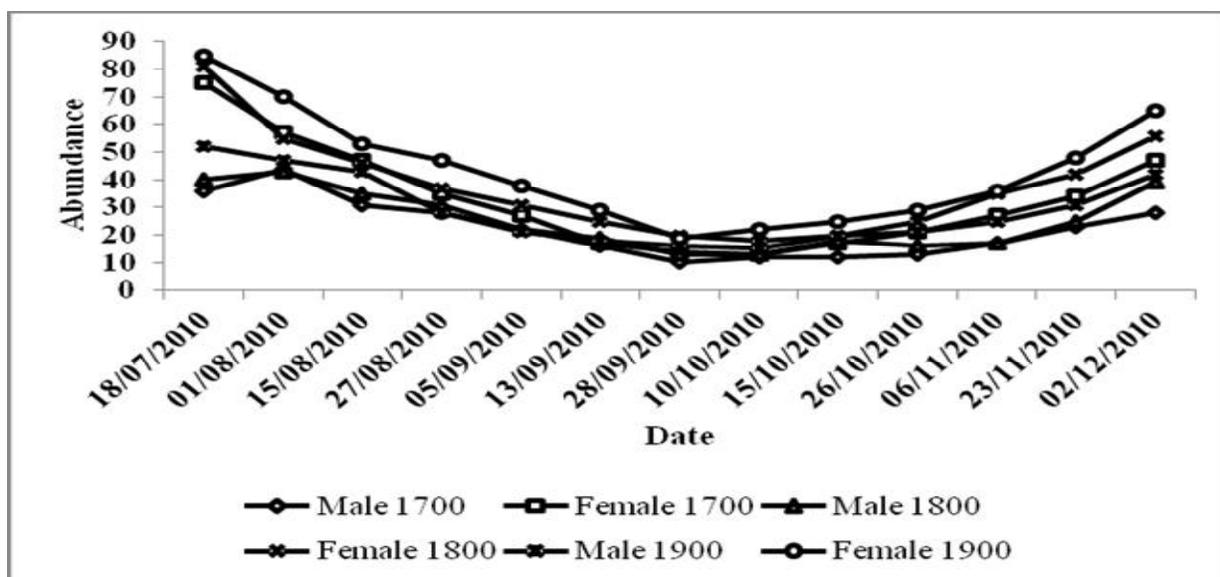


Fig4. Abundance of male and female seven spotted ladybird in three altitudes 1700, 1800 & 1900m and alfalfa field in this region from 18/7/2010 to 2/12/2010

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