An Investigation on Spider Fauna of Cereal Fields in Antalya (Araneae)

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Abstract

In the spring and summer months of 2005-2006, spider samples were collected from different localities in Antalya for determining spider fauna of cereal fields. Spiders were collected by means of hand aspirator, sweeping net and Japanese umbrella. A total of 629 specimens were obtained from wheat, oats and maize fields, and 41 species belong to 34 genera in 16 families. Field preferences of the species were determined in the agricultural ecosystem. *Tibellus oblongus* (Walckenaer, 1802) (Philodromidae), *Tenuiphantes tenuis* Latreille, 1806 (Linyphiidae), *Pardosa proxima* (C.L.Koch, 1847) (Lycosidae) and *Tetragnatha montana* Simon, 1874 (Tetragnathidae) were the most abundant species among the spiders. *Monaeses israeliensis* Levy, 1973 and *Tmarus piochardi* (Simon, 1866) are new records for the Turkish spider fauna.

Key words: Spider, Fauna, Cereal fields, Antalya, Turkey

INTRODUCTION

Spiders live together with insects in agricultural ecosystems. Ecological and faunistical investigations that made on spiders demonstrated that spiders can control insects and their larvae populations in terrestrial ecosystems [1-5]. According to the researchers, each of Linyphiidae, Lycosidae, Philodromidae, Thomisidae and Araneidae groups constituted to 60 % of the field fauna [6-8]. In addition, spiders are good indicators in agricultural fields and they demonstrate the environmental quality [9]. Therefore investigations on spiders in agricultural ecosystems are gradually increasing [6, 10,11].

Some works were performed on spider fauna of cereal fields, soybean, alfaalfa, cotton and tobacco fields in America, Europea, Turkey and the Far East. For instance, in cotton fields, wolf spiders as 29 %, dwarf spiders as 15 % were found . Like wise, in cereals, wolf spiders as 27 %, crab spiders as 21 %; in tobacco fields, wolf spiders as 21 %, ambushers as 23 % were found. Also, in alfaalfa fields, wolf spiders as 19 %, ground runners as 20 % were represented [12-18].

Nyffeler was separated two zones to field spiders: the ground zone (1) and vegetation zone (2) [19]. Linyphiidae, Tetragnathidae and Theridiidae as web-weavers take part in the vegetation zone, while Lycosidae, Oxyopidae, Thomisidae and Salticidae as hunting spiders take part in the ground zone [2,19]. Mostly these spiders feed on Diptera, Hemiptera, Homoptera, Hymenoptera and Lepidoptera insects. For instance, March *et al.* established that in cereal fields, *Tenuiphantes tenuis, Erigone dentipalpis* (Linyphiidae) and *Pardosa agrestis* (Lycosidae) as the most abundant species were reduced the aphid populations in ratio of 45 % in laboratory conditions [20].

The aim of the present study is to determine the spider fauna of cereal fields in Antalya.

MATERIALS AND METHODS

In order to establish the spider fauna of the cereal fields, spider specimens were monthly collected from wheat (*Triticum sativum* L.), oats (*Avena fatua* L.) and maize (*Zea mays* L.)

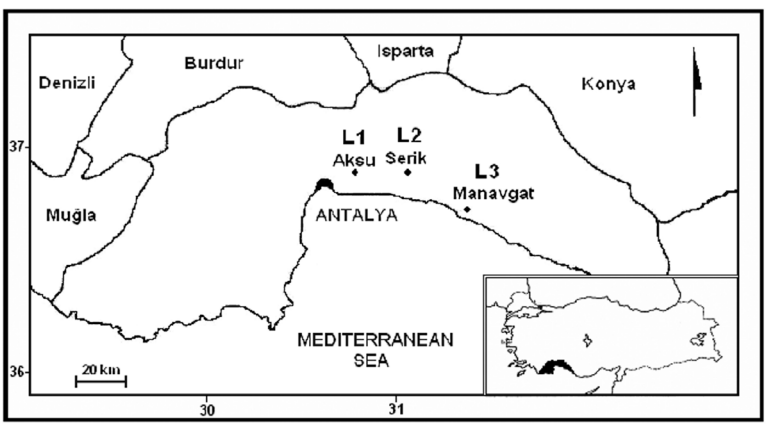

Figure 1. The map of the investigated localities

fields in Antalya in spring and summer of 2005 and 2006. The following localities were choosen: Wheat fields in Aksu (L1), maize fields in Serik (L2), oats fields in Manavgat (L3) (Fig. 1). The wheat and oats fields were similar. The plant highness and biomass were changeable according to the months but the most available season was june for spider collections. The fields were generally surrounded by shrubs or other fields (Fig 2a-b). Five fields were choosen in each locality.

A total of 629 specimens were collected using hand aspirator, sweeping net and Japanese umbrella. The specimens were put into alcohol 70 percent, labeled and carried to the laboratory. The keys of Heimer & Nentwig [21], Roberts [22] and Tyschenko [23] were used for identification, and the specimens were identified at species level using a binocular stereo microscope. The specimens were preserved in the Zoology Research Laboratory of Kırıkkale University.

a **b**

Figure 2. The scene from the investigated localities; **a)** Wheat, **b)** Maize

RESULTS

A total of 629 specimens were collected from wheat, oats and maize fields, and examined under stereo microscope. 40 species belong to 34 genera in 16 families were established. Among the specimens 245 individuals were adults (39 %). Spider species that collected from the cereal fields, sex and immature numbers of each species were shown in Table 1.

As a result, a total of 328 individuals were obtained as belong to 16 families in the wheat/oats fields. A total of 139 adults (42.4 %) and 189 immature (57.6 %) were determined. 41 species were established from adult individuals in the wheat/oats fields. Female/male ratio of adults was 1/1.015.

Frequency of spider catched in the wheat/oats fields are shown in Table 2. and Fig 3. As a result, in these fields, the most abundant family was Lycosidae (17.07 %), followed by Philodromidae, Linyphiidae and Thomisidae, respectively. The most abundant species was *Tenuiphantes tenuis* with 20 individuals (i) (Fig 4a), followed by *Microlinyphia pusilla* (15 i), *Pardosa proxima* (12 i) (Fig. 4b), *Pisuara mirabilis* (10 i) (Fig. 4c), *Thomisus onustus* (9 i), *Alopecosa fabrilis* (8 i) and *Tibellus oblongus* (8 i) (Fig. 4 d), respectively.

A total of 301 individuals belong to 15 families were obtained in the maize fields. A total of 106 adults (35.2 %) and 195 immatures (64.8 %) were determined in these fields, and 40 species were determined. Female/male ratio of adults was 1/1.35.

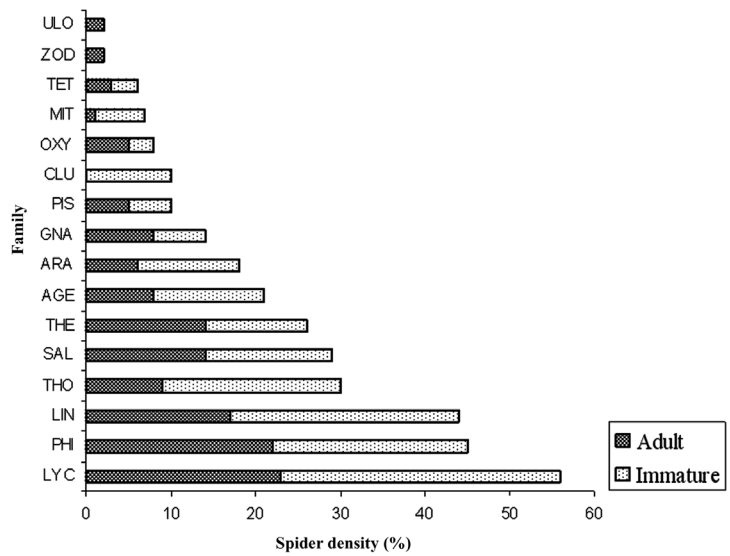

Figure 3. Spider density of the wheat/oats fields as to families

Figure 4. The most abundant species of the fields: **a.** *Tenuiphantes tenuis,* **b.** *Pardosa proxima,* **c.** *Pisuara mirabilis,* **d.** *Tibellus oblongus*

Table 1. The spider species that collected from the Antalya cereal fields and sex and immature number of each species (A=Adult, I=Immature)

TAXA	LOCALITIES						
Family / Species	Wheat / Oats			Maize			Total
	A♀	A♂	I	A♀	A♂	I	A + I
1. ULOBORIDAE							
Uloborus walckenaerius Latreille	1	1	0	0	3	2	7
2. THERIDIIDAE							
Steatoda bipunctata (Linnaeus)	1	2	2	0	1	5	11
Steatoda grossa (C. L. Koch)	2	3	5	1	2	5	18
Theridion sisyphium (Clerck)	4	0	3	1	2	6	16
Theridion sp.	2	0	2	1	0	9	14
3. LINYPHIIDAE							
Microlinyphia pusilla (Sundevall)	5	3	7	3	1	4	23
Tenuiphantes tenuis (Blackwall)	2	7	11	4	1	2	27
Tenuiphantes sp.	0	0	9	0	2	0	11
4. TETRAGNATHIDAE							
Tetragnatha montana Simon	1	2	3	5	3	12	26
5. ARANEIDAE							
Araneus sp.	0	0	9	0	0	4	13
Cyclosa conica (Pallas)	1	0	0	1	0	2	4
Neoscona adianta (Walckenaer)	4	0	3	1	0	5	13
Neoscona subfusca (C.L. Koch)	1	0	0	1	0	0	2
6. LYCOSIDAE							
Alopecosa accentuata (Latreille)	1	2	3	1	0	4	11
Alopecosa albofasciata (Brullé)	1	3	4	1	1	3	13
Pardosa agrestis (Westring)	3	0	0	0	2	0	5
Pardosa monticola (Clerck)	0	0	0	0	3	0	3
Pardosa proxima (C.L. Koch)	6	3	3	0	0	0	12
Pardosa sp.	0	0	20	0	1	9	29
Trochosa ruricola (De Geer)	1	3	3	1	2	7	17
7. PISAURIDAE							
Pisuara mirabilis (Clerck)	1	4	5	1	8	11	30
8. OXYOPIDAE							
Oxyopes lineatus Latreille	0	3	3	1	2	8	18
Oxyopes ramosus (Martini & Goeze)	2	0	0	1	0	0	3
9. AGELENIDAE							
Agelena labyrinthica (Clerck)	1	5	2	1	2	5	17
Agelena gracilens C.L. Koch	0	2	1	1	1	0	5
Tegenaria sp.	0	0	10	0	0	6	16
10. MITURGIDAE							
Cheiracanthium mildei L. Koch	1	0	6	0	1	3	11
11. CLUBIONIDAE							
Clubiona sp.	0	0	10	0	0	3	13
12. ZODARIIDAE							
Zodarion germanicum C.L. Koch	0	2	0	0	0	0	2
13. GNAPHOSIDAE							
Drassodes pubescens (Thorell)	1	2	2	0	1	2	8
Phaeocedus sp.	0	1	2	0	0	1	4
Trachyzelotes pedestris (C.L. Koch,)	3	1	2	2	3	1	12
14. PHILODROMIDAE							
Philodromus aureolus (Clerck)	2	0	0	0	0	0	2
Philodromus rufus Walckenaer	0	0	0	3	0	0	3
Philodromus sp.	0	0	15	0	0	19	33
Tibellus oblongus (Walckenaer)	13	7	8	5	13	22	68
15. THOMISIDAE							
Misumena vatia (Clerck)	1	0	1	0	0	0	2
Monaeses israeliensis Levy	0	1	0	1	0	0	2
Synaema globosum (Fabricius)	1	1	0	0	1	0	3
Thomisus onustus (Walckenaer)	1	2	6	1	2	4	16
Tmarus piochardi (Simon)	0	1	0	0	1	0	2
Xysticus kempeleni Thorell	1	0	0	0	0	0	1
Xysticus sp.	0	0	14	0	0	8	22
16. SALTICIDAE							
Euophrys frontalis (Walckenaer)	1	0	0	2	0	0	3
Euophrys lanigera (Simon)	0	3	0	1	0	0	4
Habrocestum latifasciatum (Simon)	1	4	0	0	1	0	6
Heliophanus equester L. Koch	3	0	0	1	0	0	4
Heliophanus dubius C.L.Koch	0	0	0	2	0	0	2
Heliophanus sp.	0	0	13	0	1	15	29
Philaeus chrysops (Poda)	0	2	2	1	0	8	13
Total	69	70	189	45	61	195	629
TOTAL	328			301			629

Frequency of spider catched in the maize fields are shown in Table 2. and Fig 5. As a result, the most abundant family was Philodromidae (20.59 %), followed by Lycosidae, Theridiidae and Salticidae, respectively. The most abundant species was *Tibellus oblongus* with 40 i (Fig 4a), followed by *Pisuara mirabilis* (20 i) and *Tetragnatha montana* (20 i), respectively.

According to the total individual numbers, while 328 individuals were catched in the wheat/oats fields, this number was 301 (1.09/1) in the maize fields. Also, female/male ratio was greater in the wheat/oats fields than that found in the maize fields. While the wheat-oats and maize ratio was 1.53/1 for females, this ratio was same also for males. However, the immature numbers were high in the maize fields (1:1.03).

Table 2. According to the field types, total individual numbers (TIN) of the spider families and their frequency (%)

L	Family	TIN	%
Wheat + Oats	Lycosidae (LYC)	56	17.07
	Philodromidae (PHI)	45	13.71
	Linyphiidae (LIN)	44	13.41
	Thomisidae (THO)	30	9.14
	Salticidae (SAL)	29	8.84
	Theridiidae (THE)	26	7.92
	Agelenidae (AGE)	21	6.4
	Araneidae (ARA)	18	5.48
	Gnaphosidae (GNA)	14	4.26
	Pisauridae (PIS)	10	3.04
	Clubionidae (CLU)	10	3.04
	Oxyopidae (OXY)	8	2.43
	Miturgidae (MIT)	7	2.13
	Tetragnathidae (TET)	6	1.82
	Zodariidae (ZOD)	2	0.6
	Uloboridae (ULO)	2	0.6
Maize	Philodromidae (PHI)	62	20.59
	Lycosidae (LYC)	35	11.6
	Theridiidae (THE)	32	10.6
	Salticidae (SAL)	32	10.6
	Pisauridae (PIS)	20	6,64
	Tetragnathidae (TET)	20	6.64
	Thomisidae (THO)	18	5.98
	Linyphiidae (LIN)	17	5.64
	Agelenidae (AGE)	16	5.31
	Araneidae (ARA)	14	4.65
	Oxyopidae (OXY)	12	3.98
	Gnaphosidae (GNA)	10	3.32
	Uloboridae (ULO)	5	1.66
	Miturgidae (MIT)	4	1.32
	Clubionidae (CLU)	3	0.99

DISCUSSION

Exceptional abundant spider species in the arable fields over agricultural ecosystems are described as agrobionts. In an ecological investigation made on spiders in the Germany cereal fields, *Oedothorax apicatus* (Blackwall, 1850), *Erigone dentipalpis* (Wider, 1834), *Meioneta rurestris* (C.L.Koch, 1836) and *Tenuiphantes tenuis* (Linyphiidae) and *Pachygnatha degeeri* Sundevall, 1830 (Tetragnathidae) were determined as agrobionts [8]. Also, in a faunistical investigation made in the Hungarian arable fields, *Pardosa agrestis* (Lycosidae), *Oedothorax apicatus, Pachygnatha degeeri* and *Tibellus oblongus* (Philodromidae) were founded as agrobiont spiders [24]. In addition to this, agrobiont species varies according to the field type. But in many investigation, spider families as Linyphiidae, Lycosidae, Philodromidae and Tetragnathidae were always numerical excess [25-26]. Also in our studies, *T. oblongus, T. tenuis, Pardosa proxima* and *T. montana* were founded as a most abundant species.

In this research, field studies were realized entirely at daytime. Nevertheless, the most of web-weavers are nocturnal. In addition to this, nocturnal species pass daytime under the barks, in the twisted foliage or on/under foliage. Therefore, deficiencies of night study were compensated by collecting

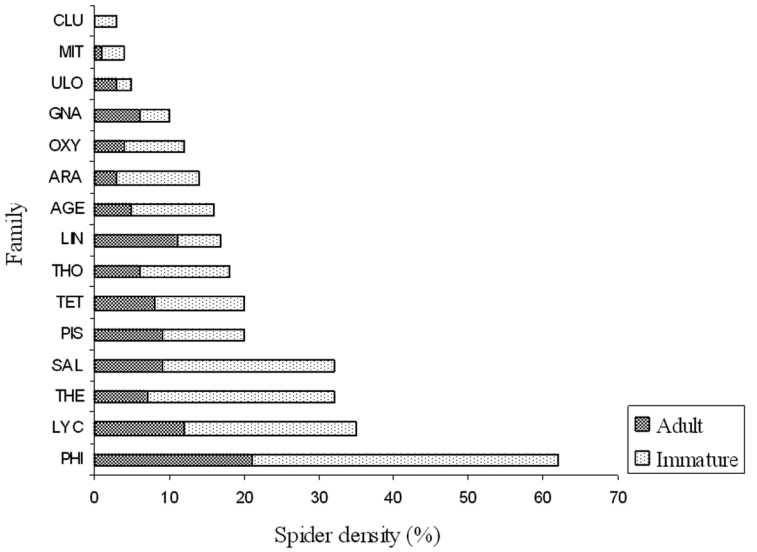

Figure 5. Spider density of the maize fields as to families

spider specimens also from this habitats. But entire faunistical studies must be performed by take into consideration the time and photoperiodizm.

Besides, spider abundance in fields varies also as to time, habitat and collecting methods [27]. Because each spider prefers different habitat. For instance, while pitfall traps collect mostly the ground zone spiders, sweeping nets collect the vejetation zone spiders. Consequently, the methods and types of habitat mustn't be neglected.

As above mentioned, the arable areas were separated two zones [11,28]. On the each zone in which take part different spider groups. While spiders of Lycosidae, Gnaphoside, Clubionidae, Thomisidae and Philodromidae are prefer the ground zone, web-weavers as Araneidae, Tetragnatidae, Theridiidae and Linyphiidae prefer the vejetation zone. For instance, in Europe, Araneidae, Tetragnathidae, Linyphiidae, Theridiidae in soybean, alfalafa, peanut and rice fields; whereas, ambushers and stalkers as Thomisidae, Philodromidae, Pisauridae, Salticidae and Oxyopidae in maize, cotton and sugar beet fields were seen [11, 28, 29]. Also in our studies, same results were determined.

Otherwise, fields as a soybean, alfaalfa, maize and peanut that contained more than spiders of sorghum, oats and rice fields [11]. In our studies, in point of spider density, maize and wheat/oats ratio was determined as 1/1.09. This result was arised from studying early period (June) in the maize fields and graining periods in the wheat fields. While maize plants were put in order, wheat was planted by sprinkling methods. Namely, wheat fields were included more dense vegetation (Fig. 2a-b).

Adjacent factor (natural mosaic of habitat in the environment) was effective also in the two fields that increased to species number of spider and density of population [7]

Consequently, field type in the surroundings of the field is closely concerned to the spider density.

In this study, adult individuals were evaluated in general and identification of the species was made as genital organs. But some species have a characteristic folium and body. So, identification of these immature individuals are not difficult. Thus, the immatures in advanced phases (subadults) were added to individual number of the species.

This research was constituted that a part of a maintaining project[1]. Real spider fauna of wheat/oats and maize fields will appear when the project is completed.

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