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THE PHENOLOGY AND ABUNDANCE OF CERTAIN SPECIES OF *ORIUS* (HEMIPTERA : ANTHOCOR1DAE) THAT OCCUR IN GREECE

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ABSTRACT

A survey was conducted in 1995, mainly in Central Greece, to record the native species of the genus *Orius* found by collecting plant samples; the seasonal abundance of *Orius* species had been studied also in 1992 and 1993 by identifying and counting those caught in Moericke water traps placed in fields of cotton, tomato and tobacco. The species of *Orius* that were found on several crops and weeds were *O. niger* (Wolff), *O. vicinus* Rib., *O. laticollis* Reuter, *O. hon'athi* (Reuter), *O. laevigatas* (Fieber), *O.pallidicornis* (Reuter) and *O. majusculus* (Reuter). The two most widespread species were *O. niger* and *O.pallidicornis.* The first was found in pepper flowers and on the leaves of tomato plants, whereas *O.pallidicornis* was always recorded from the flowers of the weed *Ecballium elaterium* (L.). *O. niger* was the species caught most frequently in water traps, and more were caught in cotton than in tomato or tobacco fields. Although the number of *O. niger* peaked in August-September in both the years 1992 and 1993 in cotton fields, there was no definite pattern to the numbers caught in tomato and tobacco fields.

KEY WORDS: *Orius*, predatory bugs, seasonal abundance, Greece.

INTRODUCTION

The western flower thrips (WFT), *Frankliniella occidentalis* (Pergande), which has been introduced during the last few years into the Mediterranean region (Bournier and Bournier, 1987; Arzone et al., 1989; Roditakis, 1991), is a serious pest, mainly because it is extremely polyphagous; it can infest many types of vegetable, ornamental and fruit crops, both under protected and outdoor conditions. Moreover, WFT is an effective vector of the tomato spotted wilt virus that causes considerable damage to many vegetable crops.

Several species of the genus *Orius* Wolff, which are both polyphagous and effective biological control agents, can provide substantial control of WFT: they feed mainly on thrips, and particularly WFT, but also on whiteflies, aphids, mites and the eggs of certain Lepidoptera.

Orius insidiosus (Say) is a natural enemy of WFT and is used worldwide in biological control programmes. However, according to Van De Viere and Degheele (1992), *Orius niger* (Wolff) is much better adapted to short-day conditions than *O. insidiosus.* Similar specificity was found by Tommasini and Nicoli (1994) who described four species of *Orius*, each of which was different with respect to prey consumption, mortality and its suitability for mass rearing.

In an experiment carried out on a protected green pepper crop, *O. laevigatus* (Fieber) was able to maintain a population of WFT at a very low level (Tavella et al., 1991). Populations of *O. laevigatus* were considered to be potentially important biological control agent of WFT on strawberry crops (Villevieille and Millot, 1991).

It seems likely that each *Orius* species is adapted to certain host plants, prey species and environmental conditions. Therefore, it is important to study native species of *Orius* to select those that could possibly be used to control pest species in particular crops and conditions.

Nine species of *Orius* have been found recently in Spain on various crops and weeds (Ferragut and González Zamora, 1994; Riudavets and Castañé, 1994), and *O. niger* has been found on cotton crops in Greece (Lykouressis, 1993).

This paper describes efforts to record the species of *Orius* found on cultivated and wild plants in Central Greece and the phenology and seasonal abundance of certain species found in some field crops.

MATERIALS AND METHODS

Species of *Orius* were collected by sampling plant material from a wide range of plants. Leaves, flowers and stems, bearing adults or nymphs, were placed into plastic bags and taken to the laboratory. Whenever nymphs were found, they were transferred into plastic petri dishes and fed on their host plants until they became adults, as *Orius* species can be identified accurately only from adult characteristics. The samples were collected in 1995 from several areas of Greece, mainly from Central Greece. The specimens collected were identified using the available keys (Stichel, 1962; Péricart, 1972; Ferragut and González Zamora, 1994).

The seasonal abundance of certain *Orius* species was studied in three cultivated crops during 1992 and 1993 by using Moericke water traps (Moericke, 1951). The traps consisted of steel trays ($60 \times 60 \times 10$ cm) that were painted yellow inside (580 nm reflectance), and supported on a metal frame 70 cm above ground.

In 1992, 3 traps were placed in a cotton field near Thiva, county Boiotia, and 6 traps into a nearby crop of processing tomatoes. The traps in the cotton field were maintained from the end of June 1992 until the end of December 1993. Traps were placed in the tomato field at the end of June 1992 and maintained until the end of September 1992. In the following year, the same number of traps was placed in a field of fresh market tomatoes near Akraiphnio, county Boiotia, from June 1993 until the end of September 1993. Three traps were also placed in a tobacco field in county Aitoloakarnania, Western Greece, from mid-April until mid-August 1993.

Each trap was filled with water to which a few drops of detergent were added. The traps were inspected twice a week and the insects caught were placed into plastic vials that contained storage fluid (2 volumes ethyl alcohol 90-95% and 1 volume lactic acid 75 w/w) (Eastop and van Emden, 1972). In the laboratory, the *Orius* species were separated from the other insects, identified using the keys mentioned earlier and counted.

RESULTS

Seven species of *Orius* were found during the survey. These were *Orius niger*, *O. vicinus* Rib., *O. laticollis* Reuter, *O. horvathi* (Reuter), *O. laevigatus*, *O. pallidicornis* (Reuter) and

O. majusculus (Reuter). The species recorded, their host plant, location and date are shown in Table 1.

O. niger was found most frequently in green pepper flowers and on the leaves of tomato plants in several areas of Central Greece. In green pepper, 1 or 2 individuals were usually found feeding in each flower, but sometimes 4 or more were observed.

Although *O. vicinus* was found mainly on the leaves of *Populus alba* (L.) (Salicaceae), it was also observed on the leaves of tomato plants growing on the campus of the Agricultural University of Athens.

O. laticollis (synonym: *O. ossiannilssoni* (Péricart, 1971)) was also found in very low numbers on the leaves of *P. alba*, at the end of September 1995. Also, adults and nymphs of *O. horvathi* were found on leaves of *P. alba* during September 1995.

O. laevigatus was found in West Peloponnesus during May 1995 only on leaves of the weed *Verbena officinalis* (L.) (Verbenaceae).

The most numerous species was *O. pallidicornis*, with as many as 10–20 adults and nymphs being found in each flower of *Ecballium elaterium* (L.) (Cucurbitaceae).

Adults of *O. majusculus* were found in July 1995 on maize leaves collected at Kavala, northern Greece. This was the only occasion on which *O. mujusculus* was recorded.

TABLE 1

Species of *Orius* found on several crops and other plants mainly in Central Greece

Species	Host plant	Location	Date
Orius horvathi	*Populus alba*	A.U.A.	6/9/95
Orius laevigatus	*Verbena officinalis*	Kyparissia (W.P.)	27/5/95
Orius majusculus	*Zea mays*	Kavala (N.G.)	4/7/95
Orius niger	*Lycopersicum esculentum*	Orchomenos (C.G.)	20/6/95
	Capsicum annum	Pelasgia (C.G.)	27/6/95
	Capsicum annum	Amaliada (W.P.)	15/8/95
	Lycopersicum esculentum	Vaghia (C.G.)	8/9/95
	Capsicum annum	Porario (C.G.)	11/9/95
	Lycopersicum esculentum	Thiva (C.G.)	11/9/95
Orius laticollis	*Populus alba*	A.U.A.	27/9/95
Orius pallidicornis	*Ecballium elaterium*	Volos (C.G.)	27/6/95
		Attica (C.G.)	20/7/95
		Kos (A.I.)	26/7/95
		Amaliada (W.P.)	14/8/95
		Boiotia (C.G.)	8/9/95
		Korinthia (C.G.)	21/9/95
		Crete (A.I.)	1/11/95
		Attica (C.G.)	5/11/95
Orius vicinus	*Populus alba*	A.U.A.	6/9/95
	Lycopersicum esculentum	A.U.A.	21/9/95

A.U.A. = Campus of the Agricultural University of Athens; W.P. = Western Peloponnesus; N.G. = Northern Greece; C.G. = Central Greece; A.I. = Aegian Island

O. niger was the most abundant species found in the traps placed in cotton fields. In 1992, it was caught in traps from the middle of July until the beginning of November (Fig. 1a). Most individuals were caught during August and early September. The following year, individuals were trapped from the beginning of June until mid-October (Fig. 1b) and were again most numerous during August and September. *O. laevigatus* was found in traps only in 1993. Catches of this species were always sporadic and the total numbers caught were extremely low (Fig. 3b).

Only two species of *Orius*, *O. niger* and *O. vicinus*, were caught in the traps placed in

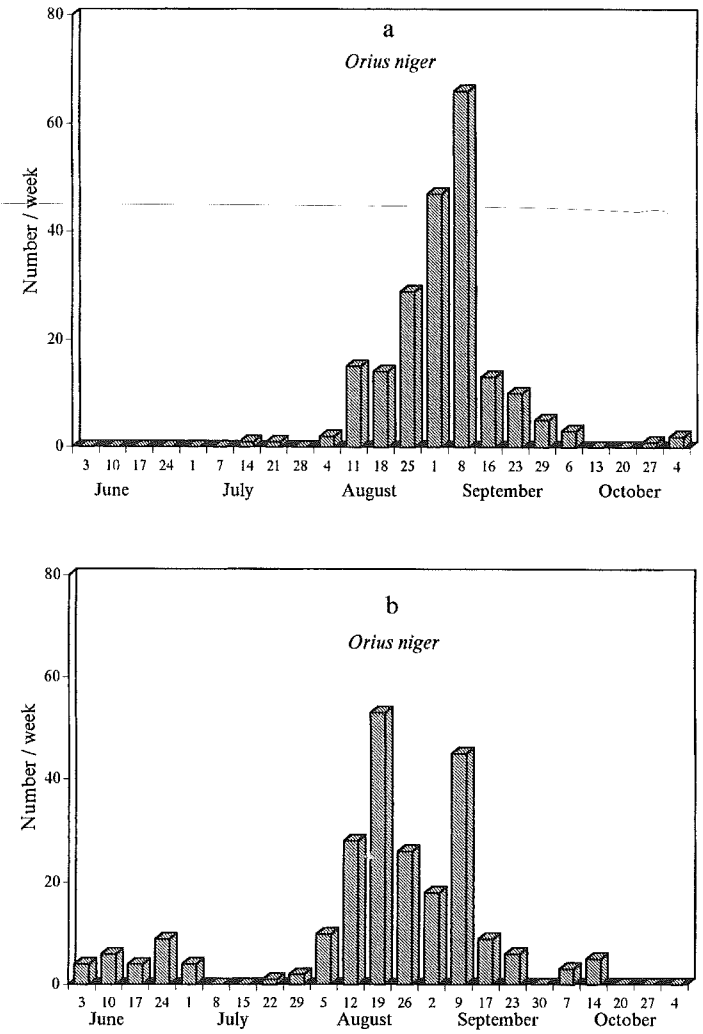

Fig. 1. Number of adults of *Orius niger* found per week in 3 Moericke water traps placed in a cotton field in county Boiotia (Central Greece) in 1992 (a) and 1993 (b).

processing and fresh market tomato fields. *O. niger* was caught during almost the entire period that the traps were in the field (Figs. 2a and 2b) during 1992 and 1993. Peak numbers were caught in September 1992 and in June 1993. Few *O. vicinus* were caught in the traps (Fig. 3c).

O. niger was the only species caught in the traps in the tobacco field. Its population densities were low and peaked in mid-summer (Fig. 3a). However, individuals were caught much earlier in the year (April and May), in the traps in the tobacco field than in the traps in the cotton field.

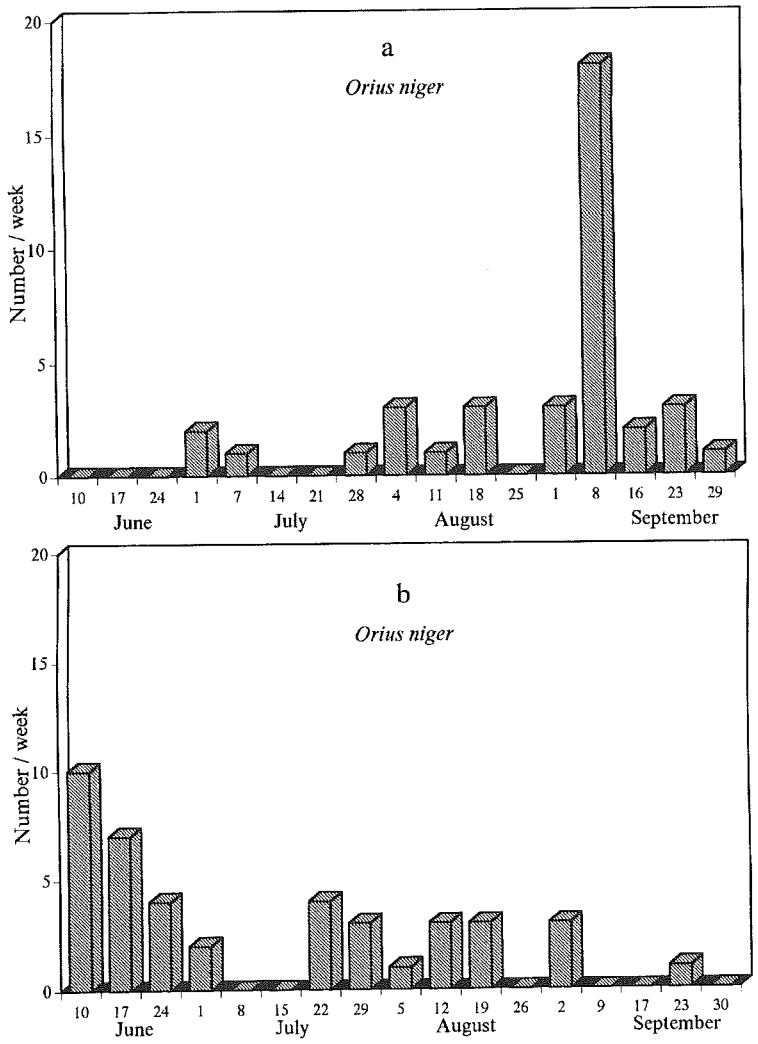

Fig. 2. Number of adults of *Orius niger* found per week in 3 Moericke water traps placed in a processing (a) and fresh market (b) tomato fields in county Boiotia (Central Greece) in 1992 and 1993, respectively.

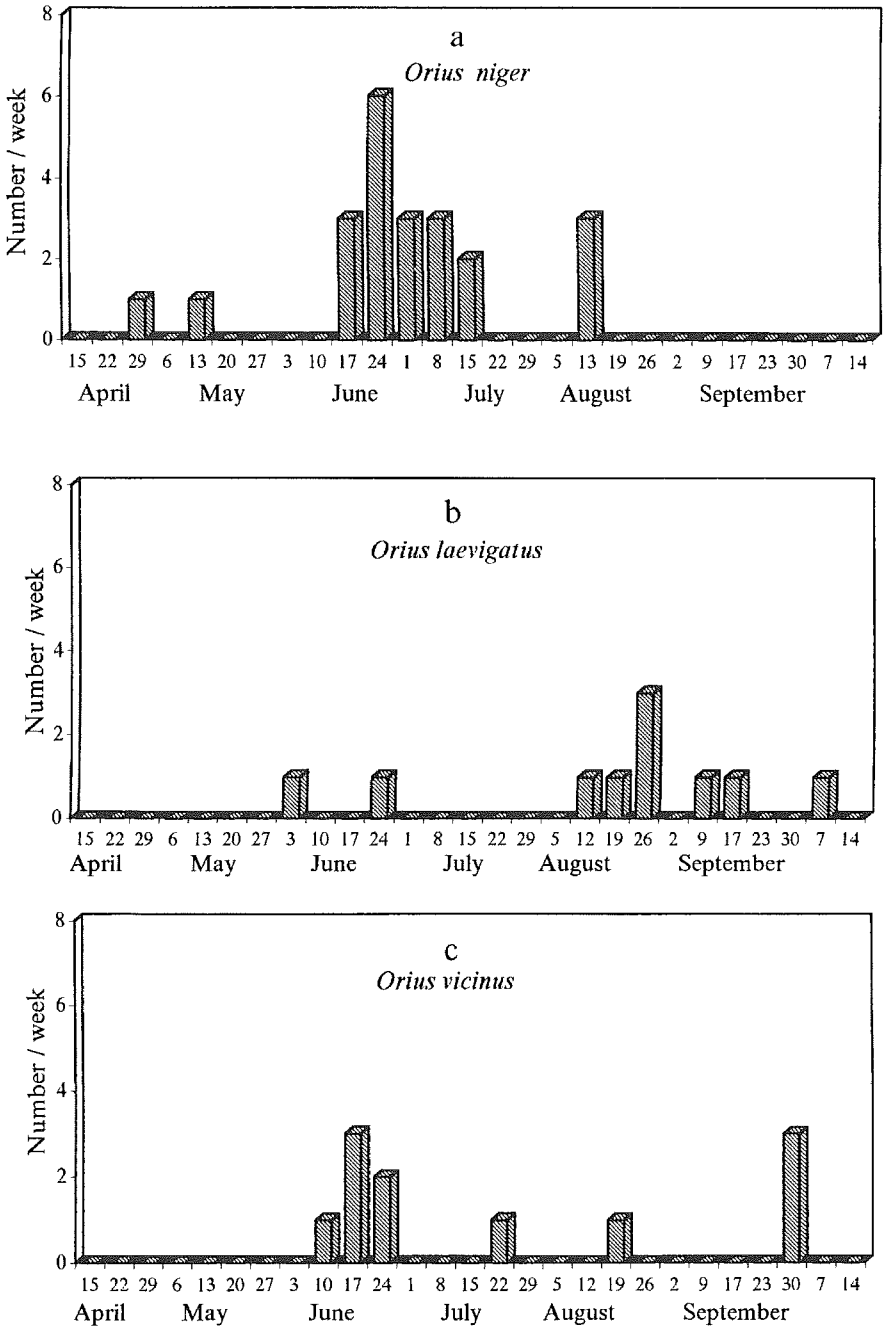

Fig. 3. Number of adult bugs found per week in 3 Moericke water traps placed in various fields in 1993: (a) *Orius niger* in a tobacco field in county Aitoloakarnania, (b) *Orius laevigatus* in a cotton field in county Boiotia and (c) *Orius vicinus* in a fresh market tomato field in county Boiotia.

DISCUSSION

O. niger was much more widespread than the other *Orius* species found in Central Greece (Figs. 1, 2 and 3). It was the most abundant species caught in the Moericke traps in all three crops (cotton, tomato and tobacco) and at both locations (Boiotia, Aitoloakarnania). However, Riudavets and Castañé (1994), and Ferragut and González Zamora (1994) reported that *O. niger* was found at low percentage of the samples of foliage collected from crop plants and weeds growing along the Mediterranean coast of Spain and the inland of Spain. This difference may be explained by *O. niger* being better adapted to the environmental conditions found in central Greece.

Only one individual of *O. laevigatus* was found on a weed, *Verbena officinalis*, in this survey in Central Greece, whereas it is considered to be the most common species in Spain (Ferragut and González Zamora, 1994).

O. pallidicornis seems to be well-adapted to the conditions of central and southern Greece as it was found in almost all places where its host plant, *E. elaterium*, was growing. It is a species that feeds on pollen and has been recorded on the same host plant in Spain (Riudavets and Castañé, 1994) and other Mediterranean countries (Stichel, 1962). Little is known about its capacity as a predator.

O. majusclslus was found only in one sample collected in northern Greece (Table 1). Riudavets and Castañé (1994) showed that this species was more common along the northern Mediterranean coast of Spain.

O. niger was trapped in higher numbers in the cotton field than in either the tomato or the tobacco field (Figs. 1, 2 and 3). In both 1992 and 1993 *O. niger* peaked in the cotton field, in August and September. This could have been a numerical response to the abundance of prey, such as whiteflies, thrips and aphids during August, or to the number of eggs of *Pectinophora gossypiella* Sanders laid during that period, as a similar phenomenon was reported for a closely-related species, *O. similis* Zheng, in China (Zhang et al., 1994).

The numbers of *O. niger* trapped in a tomato field in 1993 did not follow the same pattern as in 1992. This suggests that the individuals caught in the traps had not lived and developed on the tomato plants, but instead came from neighbouring crops and/or weeds.

In conclusion, *O. niger* may be an effective naturally occurring biological control agent in fields of cotton and other crops. The relatively rich fauna of *Orius* species found is an encouragement for the continuation of such studies.

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REFERENCES

Arzone, A., Alma, A. and Rapetti, S. 1989. *Frankliniella occidentalis* (Perg.) (Thysanoptera Thripidae) nuovo fitomizo delle serre in Italia. *Informatore Fitopatologico* 39(10):43–48.

Bournier, A. and Bournier, J. P. 1987. L'introduction en France d'un nouveau ravageur *Frankliniella occidentalis*. *Phytoma, Defénse des Cultures*, No 388:14–17.

Eastop, V.F. and van Emden, H.F. 1972. The insect material. In: Aphid Technology. Edit. H.F. van Emden. Academic Press, London. pp. 1–45.

Ferragut, F. and González Zamora, J.E. 1994. Diagnóstico y distributión de las especies de *Orius* Wolff 1811, peninsulares (Heteroptera, Anthocoridae). *Boletin de Sanidad Vegetal Plagas* 20:89–101.

Lykouressis, D.P. 1993. The occurrence of the polyphagous predator *Orius niger* (Wolff) (Hemiptera, Anthocoridae) in Greece. *Entomologia Hellenica* 11:43–44.

Moericke, V. 1951. Eine Farbfalle zur Kontrolle des Fluges von Blattläusen, insbesondere der Pfirsichblattlaus *Myzodes persicae* (Sulz.). *Nachrichtenblatt des Deutschen Pflanzenschutzdienstes* 3:23–24.

Péricart, J. 1971. Observations et nouvelles synonymies concernant les Anthocoridae et Microphysidae paléarctiques. *Bulletin de la Société Linnéenne de Lyon* 40:93–114.

Péricart, J. 1972. Hemipteres, Anthocoridae, Cimicidae, Microphysidae de l'Quest Paleartique. Massou et Cie, Paris. 420 pp.

Riudavets, J. and Castañé, C. 1994. Abundance and host plant preferences for oviposition of *Orius* spp. (Heteroptera: Anthocoridae) along the Mediterranean coast of Spain. *Bulletin IOBC/WPRS* 17(5):230–236.

Roditakis, N.E. 1991. First record of *Frankliniella occidentalis* in Greece. *Entomologia Hellenica* 9:77–79.

Stichel, W. 1962. Illustrierte Bestimmungstabellen der Wanzen. II Europa (Hemiptera–Heteroptera Europae). Berlin Hermsdorf. 2173 pp.

Tavella, L., Arzone, A. and Alma, L. 1991. Researches on *Orius laevigatus* (Fieb.), a predator of *Frankliniella occidentalis* (Perg.) in greenhouses. *Bulletin IOBC/WPRS* 14(5):65–72.

Tommasini, G.M. and Nicoli, G. 1994. Preimaginal activity of four *Orius* species reared on two preys. *Bulletin IOBC/WPRS* 17(5):237–241.

Van de Veire, M. and Degheele, D. 1992. Biological control of the Western flower thrips, *Frankliniella occidentalis* (Pergande) (Thysanoptera: Thripidae), in glasshouse sweet peppers with *Orius* spp. (Hemiptera: Anthocoridae). A comparative study between *O. niger* (Wolff) and *O. insidiosus* (Say). *Biocontrol Science and Technology* 2:281–283.

Villevieille, M. and Millot, P. 1991. Lutte biologique contre *Frankliniella occidentalis* avec *Orius laevigatus* sur fraisier. *Bulletin IOBC/WPRS* 14(5):57–64.

Zhang, G., Zong, L., Duan, H., Xiong, J., Lu, R. and Xu, F. 1994. Spatial distribution of the flower bug, *Orius similis*, and its interaction with the pink bollworm, *Pectinophora gossypiella*, in cotton fields. *International Journal of Pest Management* 40(4):309–312.