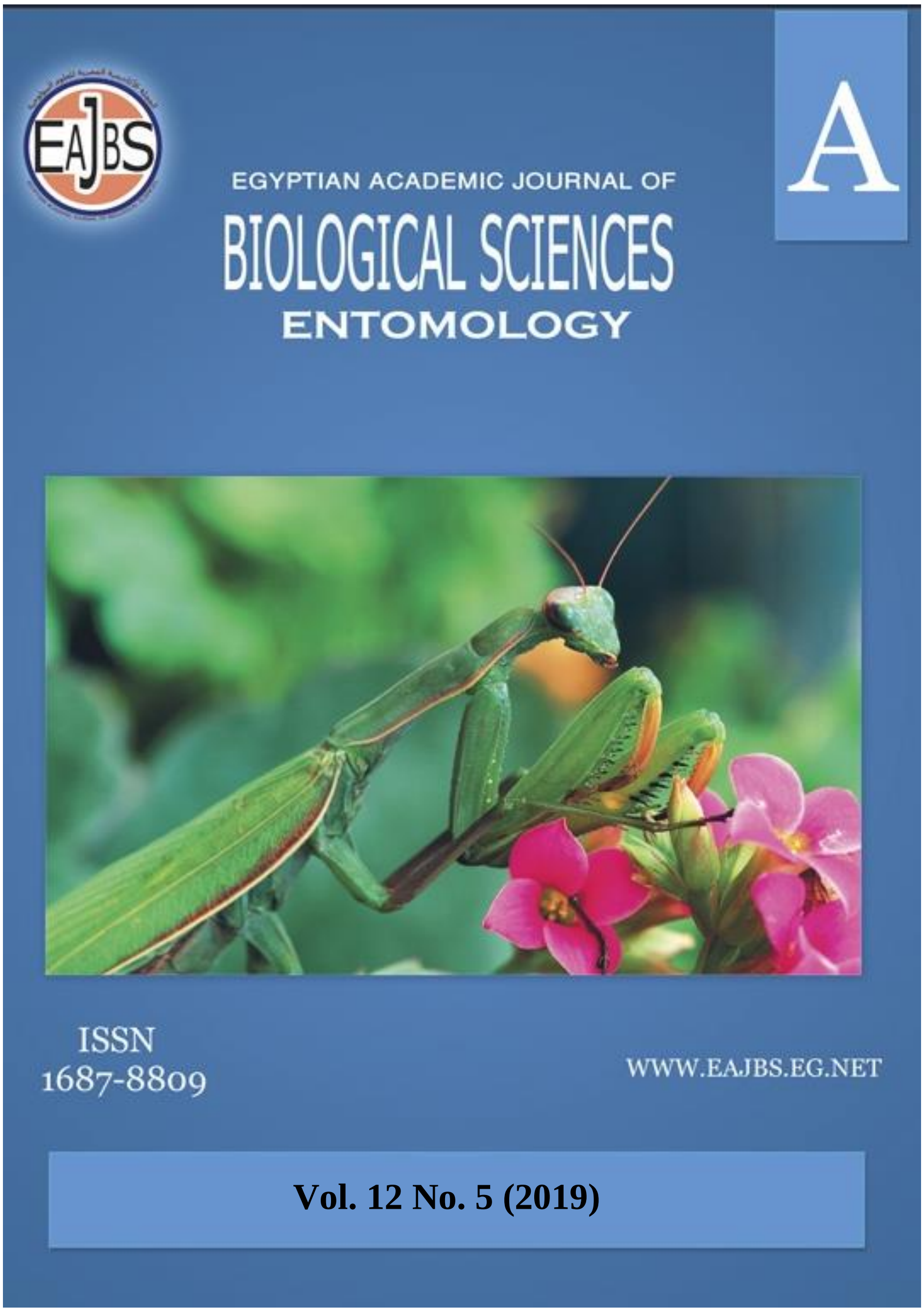


Egyptian Academic Journal of Biological Sciences is the official English language journal of the Egyptian Society for Biological Sciences, Department of Entomology, Faculty of Sciences Ain Shams University.

Entomology Journal publishes original research papers and reviews from any entomological discipline or from directly allied fields in ecology, behavioral biology, physiology, biochemistry, development, genetics, systematics, morphology, evolution, control of insects, arachnids, and general entomology.

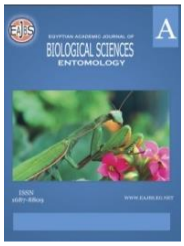
www.eajbs.eg.net

Citation: *Egypt. Acad. J. Biolog. Sci. (A. Entomology) Vol. 12(5) pp: 1-9(2019)*

Egypt. Acad. J. Biolog. Sci., 12(5):1-9 (2019)

Egyptian Academic Journal of Biological Sciences
A. Entomology

ISSN 1687- 8809
http://eajbsa.journals.ekb.eg/



Ecological Study of Insect Vectors Mechanically Transmit Parasites in Ismailia Governorate, Egypt.

Ghada M. Abdel-Gahny, Maha F. Soliman, Shereen M. El-Banna and Ahmed H. Abo-Ghalia.
Department of Zoology, Faculty of Science, Suez Canal University, Ismailia, Egypt.
Email: ghada175@yahoo.com

ARTICLE INFO
Article History
Received:8/7/2019
Accepted:12/8/2019

Keywords:
Ecological study mechanical transmisión, insects vectors, helmiths, protozoa, Ismailia Governorate, Egypt

ABSTRACT

Seven different sites were chosen in Ismailia Governorate representing areas of health and human activities that could be affected with the presence of insect vectors that assess their potential role in mechanical transmission of helminths and protozoa parasites of man. Four groups of insects were collected: Flies, cockroaches, beetles and ants. A total number of 8499 individual insects were collected during the period of study. The summer season was the most abundant season as the total insects count was 3679, autumn and spring came next to summer with 2787 and 1643 trapped insects, respectively. The lowest abundant season was winter in which only 390 insects were collected. The most important species with the highest abundance was *Chrysomia putoria* followed by *Musca domestica* with 1717 and 1707 individuals, respectively. Insects species diversity varied slightly among the months of the study period while it is noticed that insects species diversity varied greatly among the months of the study period.

INTRODUCTION

According to a World Health Organization report; presently, about one out of every six people is infected with a disease acquired through insects (W. H. O, 2006). For this reason, the importance of the study of parasites in connection with the human disease to every community in the world is becoming more and more obvious. Actually, insect-borne disease imposes also a heavy financial load, especially in developing countries and the world's poorest countries will be unable to advance economically until such health problems are brought under control. Even a single outbreak can be costly. The public, and perhaps some of our professional contemporaries, do not realize that an enormous amount of money is lost annually from the local and world economies because of attacks of insects on man or animals (Fetene and Worku, 2009).

Understanding the relationship between the insects and their ability to act as vectors of insect-borne diseases (IBDs) could provide clues as to the origin of the intimate interplay among insect, pathogen and vertebrate hosts. This conference could be the starting point in formulating plans and procedures to help to reduce or eliminate the losses caused by insects and parasites. (Otranto *et al.*, 2007). Diseases carried by insects dominate many parts of the world, particularly parts from Africa. Some authorities have suggested that civilization developed in parts of the world where humans were able to escape diseases. Nevertheless, even where continual disease could be avoided, periodic episodes could not (Cook, 1996).

The city of Ismailia lies in the north-eastern part of Egypt situated on the west bank of the Suez Canal and Sinai, it is considered as the eastern gate of Egypt. Its eastern section is located in Africa continent and its western section is located in Asia continent. It is also located approximately 120 km from Cairo in halfway between Port Said at the north and Suez in the south. The Canal widens at that point to include Lake Timsah, one of the Bitter Lakes linked by the Canal. All parts of the Governorate are joined with an integrated network of roads. This enables traffic to join the city of Ismailia with its suburbs. The latitude and longitude of Ismailia are: 30° 35' 0" N / 32° 16' 0" E at an altitude of approximately 15 m above sea level. (Figure 1).

Unfortunately, little attention has been given for the mechanical transmission of the parasitic diseases by insect vectors and for the mechanisms that may be implicated in this type of transmission. (Thyssen *et al.*, 2004 and Graczyk *et al.*, 2005). Accordingly, A comprehensive ecological study of some important insects vectors that mechanically transmit parasites and hence diseases to human in an important area like Ismailia governorate is a necessary issue. In this study, we are going to investigate the role of some insect vectors in transmission of the parasitic diseases in Suez Canal region specially Ismailia Governorate. This work will include a field study to find out the vectors species found in the study areas.

MATERIALS AND METHODS

The present study was carried out for 15 months, from April 2010 to June 2011. The first three months were considered as a preliminary survey period for samples and data collection. Then the actual fieldwork took place during one year (from July 2010 to June 2011).

Seven different sites were chosen in Ismailia Governorate representing areas of health and human activities that could be affected with the presence of insect vectors that assess their potential role in the mechanical transmission of helminths and protozoa parasites of man:

1-Suez Canal University hospitals, in this site 4 localities were selected: a) outside hospital near the garbage and the incinerator rooms. b) Hospital wards. c) Hospital bathrooms. d) Hospital kitchen

2- Male student hostel restaurant of Suez Canal University, in this site 2 localities were selected: a) outside restaurant. b) Food court.

3- Female student hostel restaurant of Suez Canal University, in this site 2 localities are selected: a) outside restaurant. b) Food court.

4- El-Salam Primary school, in this site 2 localities were selected: a) outside school. b) Inside school.

5- El-Salam disabled school, in this site 2 localities were selected: a) outside school. b) Inside school.

6- Suez road farm (Aal-Soliman farm) in this site 2 localities were selected: a) outside barn. b) Inside barn.

7- Port- Said road farm (Abu-Sabe farm) in this site 2 localities were selected: a) outside barn. b) Inside barn. All these sites are shown in figure (2). Four groups of insects were collected: Flies, cockroaches, beetles and ants.

Collection of flies was achieved by using a special type of trap named “Cone trap" (Figure 3). This is one of the most effective traps for collecting flies and wasps depending on the trap position (Olkowski *et al.*, 1991). All trapped flies were killed by chloroform and then removed from each trap separately into a plastic vial to be counted, categorized to specified species and sex groups. A representing fly to each species was placed in a Petri dish and identified with the aid of a binocular microscope to species level using morphologic criteria (Borror *et al.*, 1981). The identification was done using reference keys given by Crosskey and Lane (1993). This is beside field guides used as catalogues for identification.

Cockroaches' survey was conducted by using sticky traps, which can be easily constructed and are most convenient to use (Moore and Granovsky, 1983) (Figure 4). Trapped cockroaches from all localities were placed in labeled jars (with the labels: Date, locality and site) and transported to the laboratory for identification. The identification of cockroaches was then done using the procedures and keys described by Ross (1965). Beetles and ants were collected using pitfall trap method which was described by Southwood (1977); Slingsby and Cook (1986). This method was used for sampling surface-active soil fauna. Identification was achieved by the aid of the reference collection of the "Egyptian-British Biological Society, (EBBSoc)" museum in Zoology Department, Suez Canal University.

Fig. 1: Map showing the position of Ismailia city according to Cairo, Port- Said and Suez and its situation on Lake Timsah, one of the biter lakes linked by the Suez Canal

Fig. 2: Satellite map showing sites of study in Ismailia city: 1- Suez Canal University hospital, 2- Male student hostel, 3- Female student hostel, 4-El-Salam Primary school, 5-El-Salam disabled school, 6- Port-Said road farm and 7- Suez road farm.

Fig.3: Photo of the cone trap hanged on the wall of the barn in Port Said farm.

Fig.4: Sticky traps used to collect cockroaches showing how the outsides of the jars were wrapped with rough paper to allow the grasp of cockroaches.

RESULTS

A total number of 8499 individual insects were collected during the period of study, a list of the species identification and classification of individuals of each trapped specimen was illustrated in Table (1).

Seasonal abundance of insects

The summer season was the most abundant season as the total insects count was 3679, autumn and spring came next to summer with 2787 and 1643 trapped insects, respectively. The lowest abundant season was winter in which only 390 insects were collected. Based on the statistical output results of ANOVA test, one can conclude that there was a high significant difference between the seasons according to the number of insects (F= 110.3, DF=3, P-value < 0.01).

Table 1: List of insects taxa collected by different types of traps from the selected sites during the study period.

Sp. No.	Order	Family	Genus & Species
1	**Diptera**	**Calliphoridae**	***Chrysomia putoria***
2	**Diptera**	**Muscidae**	***Musca domestica***
3	**Diptera**	**Muscidae**	***Stomoxys niger***
4	**Diptera**	**Sarcophagida**	***Sarcophaga* sp.**
5	**Diptera**	**Sarcophagida**	***Wohlfartia magnifica***
6	**Diptera**	**Tabanidae**	***Tabanus bovinus***
7	**Diptera**	**Calliphoridae**	***Calliphora* sp.**
8	**Blattodea**	**Blattidae**	***Periplaneta americana***
9	**Blattodea**	**Blattidae**	***Blatta orientalis***
10	**Blattodea**	**Blattellidae**	***Blattella germanica***
11	**Blattodea**	**Blattellidae**	***Supella longipalpa***
12	**Coleoptera**	**Tenebrionidae**	***Blaps polychresta***
13	**Coleoptera**	**Tenebrionidae**	***Adesma sinaitica***
14	**Coleoptera**	**Tenebrionidae**	***Pmelia sercea***
15	**Coleoptera**	**Tenebrionidae**	***Trachyderma philistina***
16	**Coleoptera**	**Tenebrionidae**	***Tenebrio moliter***
17	**Coleoptera**	**Tenebrionidae**	***Zophosis planus***
18	**Coleoptera**	**carabidae**	***Calosoma olivieri***
19	**Hymenoptera**	**Formicidae**	***Monomorium niloticum***
20	**Hymenoptera**	**Formicidae**	***Catagluphis bicolar***

Monthly abundance of insects

From Figure (5)**,** it was clear that insects were found all the year-round. They increased till August 2010 which showed the highest abundance (1356 individuals), then decreased again to reach their lowest abundance in January 2011 (113 individuals). One-way ANOVA test showed a significant difference between the number of insects along the year of study, as (F=33.991, DF=11, P-Value < 0.01).

Sites abundance of insects

Figure (6) represents the abundance of insects according to the study sites. The two farms show the highest abundance where the Suez road farm abundance was 2084 insects and the Port Said road farm was 1971 insects. On the other hand, the male student hostel and El-Salam disabled school show the lowest abundance with 744 and 647 insects, respectively. The one-way ANOVA test showed a significant difference between the number of insects from the selected sites, as (F=45.042, DF=6, P-Value < 0.01).

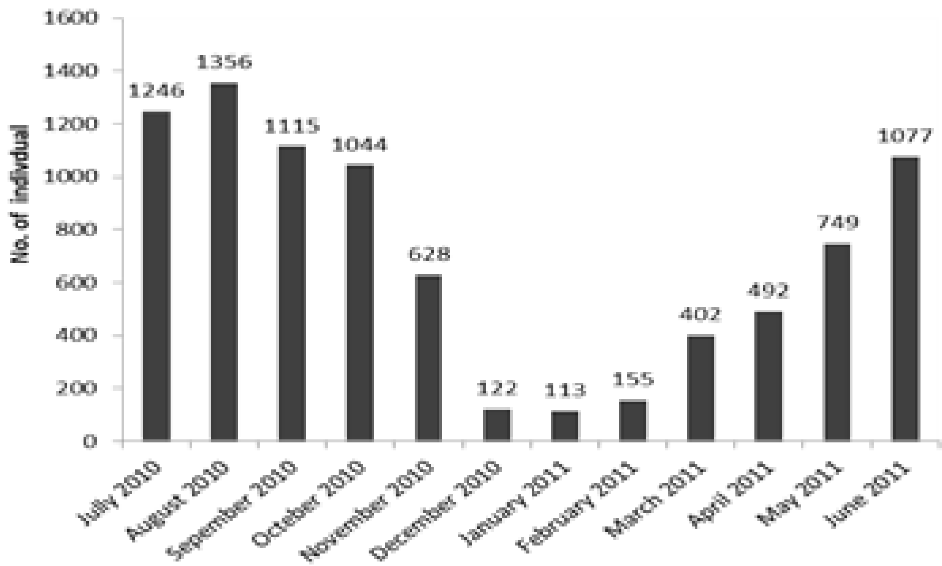


Fig. 5: Monthly abundance of insect species during the study period.

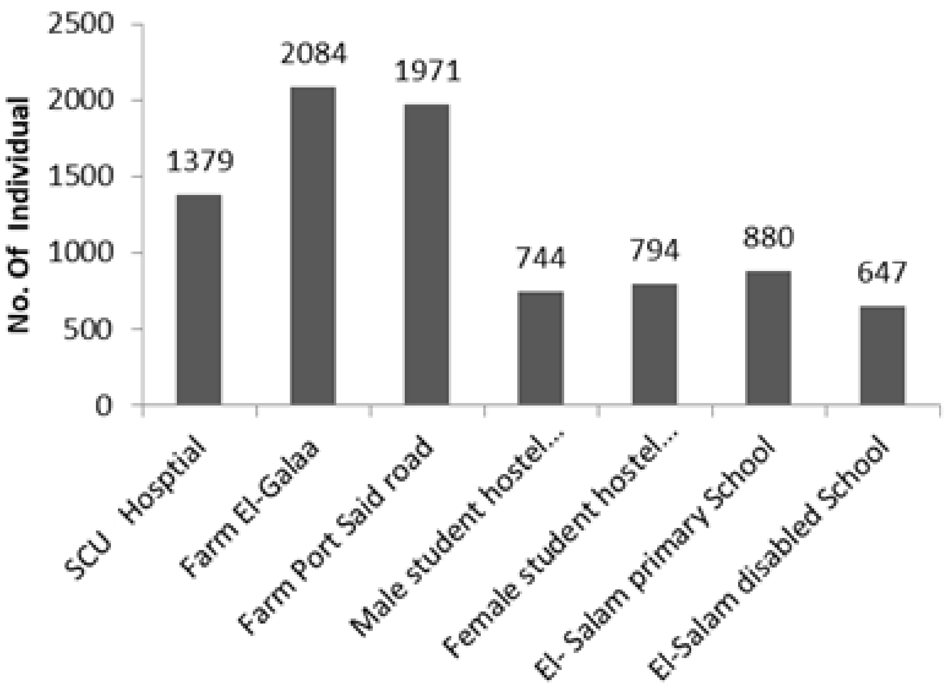


Fig. 6: Sites abundance of insects during the study period

Species importance curve

From Figure (7), it was found that the most important species with the highest abundance was *C. putoria* followed by *M. domestica* with 1717 and 1707 individuals respectively. The least important species with the lowest abundance were *C. bicolar* and *B. moristance* with 31 and 22 individuals respectively. The one way ANOVA test showed a significant difference between the orders of insects from the selected sites, as (F=91.189, DF=19, P-Value < 0.01).

Species diversity pattern among months

From Figure (8), one can easily notice that insects species diversity varied slightly among the months of the study period. The Fig. illustrates that the highest diversity was during July, August, September, October and November 2010 in addition to May and June 2011.

Species diversity pattern among sites

Figure (9) represents the variation in diversity of insect species among sites. It is noticed that insects species diversity varied greatly among the months of the study period. The Fig. Shows that the highest diversity was in Port Said road farm followed by the Suez road farm while the lowest diversity is represented by the El-Salam disabled school followed by El-Salam disabled school.

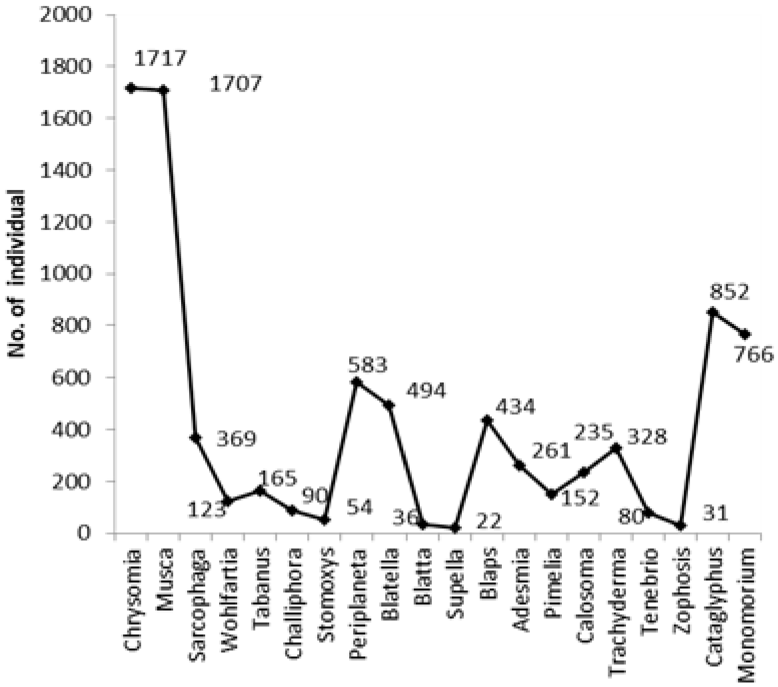


Fig. 7: Species importance curve of insects during the study period

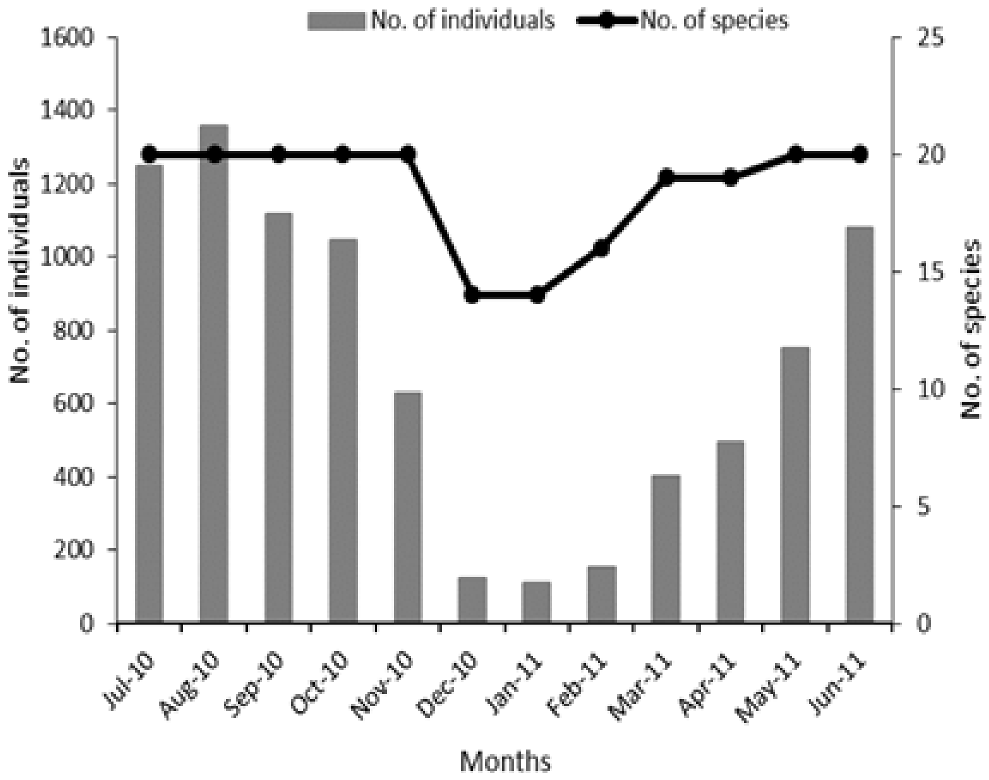


Fig. 8: Species diversity pattern of insects among months

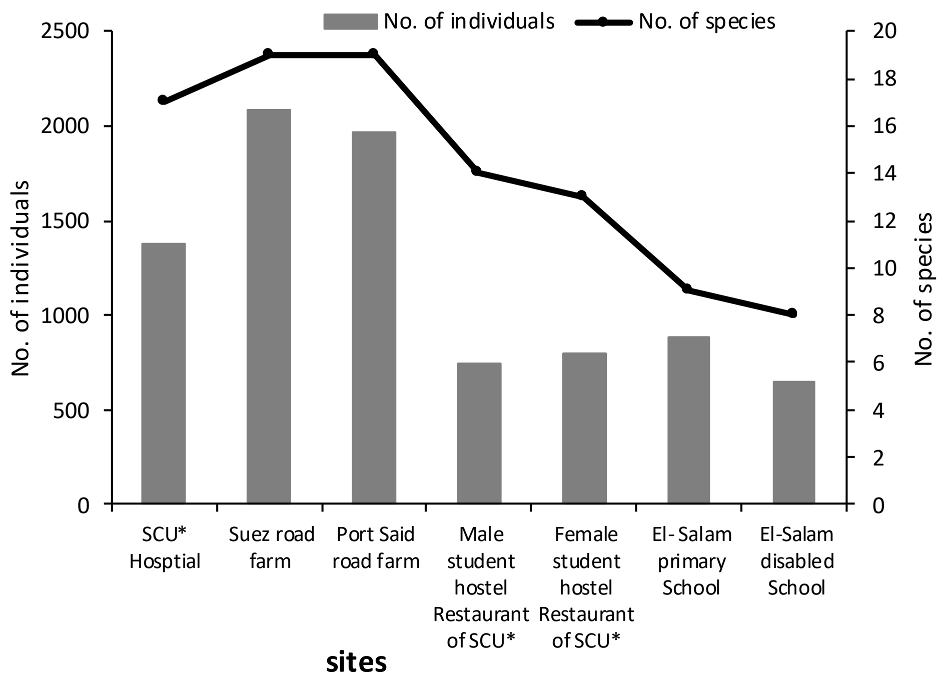


Fig. 9: Species diversity pattern of insects among sites.

DISCUSSION

The method of sampling seems to be one of the most important factors affecting results. (Abdel-Gahny *et. al.,* 2007 and 2008). The pitfall trap method described by Southwood and Henderson (2000); Slingsby and Cook (1986), is the most adopted method to collect crawling insects (beetles and ants). In the present study water and detergent haven't been used but instead sticky substance was swaped inside the tip of the trap to prevent the escape of capture insects without losing parasites on their external body surface (personal dessission). The same method with cockroaches but it is called sticky traps (Tawatsin *et. al.,* 2007) which could not be buried in the floors. Collecting flies was achieved by using cone traps which was the most effective trap for collecting flies (Olkowski et.al., 1991), which is different than other researches that use simply hand collection or sweeping net (Getachew *et. al.,*2007; Abu Hashish *et. al.,*2009 and Kenawy *et. al.,*2014).

Based on the obtained results from the seasonal abundance of the collected insects, it was found that during the summer season, insect's population size was the most abundant. The lowest abundant season was the winter. On the other hand, it was found that the abundance of insects gathered during the period from July 2010 to June 2011 varied greatly among months as the highest peak of insects was in August, while the lowest abundance was in January. These results are totally similar to Kenawy *et. al. (*2014), Abdel-Ghany *et al., (*2008). The mentioned observations lead to the suggestion that the climatic conditions play an important role in determining the activity and abundance of insects; as the high abundance is directly related to warm weather and vice versa. This suggestion agrees with Kaspari *et al.* (2000) who found that the temperature affects species abundance, density and distribution, as the temperature, in this case, acts as an estimate of activity and productivity.

Biodiversity of insect populations is generally influenced by a complex of many factors such as: altitude, climatic variability, and human intervention. Human factors are one of the most important effects on managing semi-natural habitats (Caley and Schulter, 1997). This fact agrees with the present results which revealed that inside the two farms (the Suez road farm and the Port Said road farm) showed the highest abundance. On the other hand, outside El-Salam disabled school and the bathrooms in Suez Canal university hospital show the lowest abundance. From field observations the barns are totally not clean, full of dung, wastes and garbage. While the hospital bathroom and outside the school are to some extent clean.

From the species importance curve results, it was found that the most important species with the highest abundance was *Chrysomia putoria* followed by *Musca domestica*. The least important species with the lowest abundance were *Cataglyphis bicolar* and *Blaps moristance.* This finding agreed with that of (El-Morsy *et. al., 2001* and Kenawy *et. al., 2014*).

REFERENCES

Abdel-Gahny G. M., Zalat S. M., Abo-ghalia A. H. & Semida F. M. (2007). Abundance and diversity of *Acacia tortilis* insects and araneids fauna in Wadi Mandar, Saint Catherine Protectorate, South Sinai, Egypt. *CATRINA JOURNAL:* (2).137-149.

Abdel-Gahny G. M., Zalat S. M., Abo-ghalia A. H. & Semida F. M. (2008). Ecological studies of some insects associated with Bedouin settlements in St Katherine Protectorate, South Sinai, Egypt. Egyptian Journal of Biology, 2008, Vol. 10, pp 95-103.

Abu Hashish A.T., Abdel Aal, A. A., Abou Ghalia, A. h., and Soliman, M. F. (2009).Insects as vectors of parasites in Ismailia governorate. SCVMJ, X IV (2). Pp. 213-222.

Borror D.J. DeLong M.D., Triplehorn C.A. (1981). An introduction to the study of insects. Philadelphia, PA: Saunders College Publishing

Caley M. & Shulter M. (1997). The relationship between local and regional diversity. Ecol., 36 (2): 83- 93.

Cook, G.C. (1996). Manson's Tropical Diseases, WB Saunders, London, 465 pp.

Crosskey, R.W. and Lane, R.P. (1993). House-flies, blow-flies and their allies (calypterate Diptera). In: Lane, R.P., Crosskey, R.W. (Eds.), Medical Insects and Arachnids. Chapman and Hall, London, pp. 403–428.

El–Morsy A., El–Hawagry M., Abdeldayem M, & Fadl H. (2001). Insect diversity in Zaranikn Protectorate, Northern Sinai, Egypt. Egyptian Journal of Natural History 3: 62–80.

Fetene T., Worku N. T. (2009). Public health importance of non-biting cyclorrhaphan flies ransactions of the Royal Society of Tropical Medicine and Hygiene 103, 187—191.

Getachew, S.; Gebre-Michael, T.; Erko, B.; Balkew, M. and Medhin, G. (2007). Non-biting cyclorrhaphan flies (Diptera) as carriers of intestinal human parasites in slum areas of Addis Ababa, Ethiopia. *Acta Trop., 103: 186-194.*

Graczyk T. K.; Knight, R. and Tamang, L. (2005). Mechanical transmission of human protozoan parasites by insects, Clin. Microbiol. Rev., 18 (1): 128-132.

Kaspari, M.; O'Donnell, S. & Kercher, J. R. (2000). Energy, density, and constraints to species richness: studies of insect assemblages along a productivity gradient. American Naturalist, 155:280–293.

Kenawy. M. (2014). Insects Associated with Hospital Environment in Egypt with Special Reference to the edically Important Species. *J. Egypt. Soc.Parasitol.(JESP)*,44(3),2014:665 – 676.

Moore, W.S. & Granovsky, T.A. (1983). Laboratory comparisons of sticky traps to detect and control five species of cockroaches (Orthoptera: Blattidae and Blattellidae). J. Econ. Entomol., 76(4) :854-849.

Olkowski, W.; Daar, S. & Olkowski, H. (1991). Commonsense pest control: least-toxic solution for your home, garden, pets and Community. Taunton press. Newtown. CT. 715pp.

Otranto D., Stevens J. R., Cantacessi C., and Gasse R. B., (2007) Parasite transmission by insects: a female affair. *Trends in Parasitology Vol.24 No.3* .

Ross, H.H., (1965). Cockroaches, in: A textbook of Entomology, third ed. J. Wiley & Sons, New York, NY.

Slingsby, D. & Cook, C. (1986). Practical ecology. MacMillan, London: 213pp.

Southwood, T.R.E. & Henderson, P.A. (2000). Ecological methods. 3rd edition. Blackwell Science ,Oxford: 431pp.

Tawatsin, A.; Thavara, U.; Chompoosri, J.; Kong-ngamsuk, W.; Chansang, C. & Paosriwong, S. (2007). Cockroach surveys in 14 provinces of Thailand. J. Vector. Ecol., 26(2):232-238.

Thyssen, P. J.; Moretti, T. C.; Ueta, M. T. and Ribeiro, O. R. (2004). The role of insects (Blattodea, Diptera, and Hymenoptera) as possible mechanical vectors of helminths in the domiciliary and peridomiciliary environment, Cad. *Saude Publica., 20 (4): 1096-1102.*

World Health Organization, (2006). Medical Entomology and Vector Control, Cairo, Egypt, 29-30 August. WHO/ Regional Office for the Eastern Mediterranean.18pp.

ARABIC SUMMARY

دراسة بيئية لبعض ناقلات الحشرات التي تنقل الطفيليات ميكانيكيا في محافظة الإسماعيلية، مصر

غادة محمد عبد الغنى، مها فريد سليمان، شيرين محمد البنا، أحمد حسن أبوغالية.
قسم علم الحيوان، كلية العلوم، جامعة قناة السويس، الإسماعيلية

تم اختيار سبعة مواقع مختلفة في محافظة الإسماعيلية تمثل مجالات الصحة والأنشطة البشرية التي يمكن أن تتأثر بوجود نواقل الحشرات التي تقيم دورها المحتمل في النقل الميكانيكي للديدان الطفيلية وطفيليات الإنسان. تم جمع أربع مجموعات من الحشرات: الذباب والصراصير والخنافس والنمل. تم جمع ما مجموعه 8499 من الحشرات الفردية خلال فترة الدراسة. كان موسم الصيف هو أكثر موسم وفرة حيث بلغ إجمالي عدد الحشرات 3679 ، وجاء الخريف والربيع في الصيف مع 2787 و 1643 حشرة محاصرة ، على التوالي. كان أقل موسم وفير هو فصل الشتاء حيث تم جمع 390 حشرة فقط. من أهم الأنواع ذات أعلى الوفرة كان Chrysomia putoria تليها Musca domestica مع 1717 و 1707 أفراد ، على التوالي. تباين تنوع أنواع الحشرات بشكل طفيف بين أشهر فترة الدراسة ، بينما لوحظ أن تنوع أنواع الحشرات يختلف اختلافًا كبيرًا بين شهور فترة الدراسة.