*** Deghiche-Diab Nassima**
(Algeria): Master in Integrated Pest Management (IAM Bari Italy).
diab_nassima@yahoo.fr

****Porcilli F**
Professor at the University of Bari Italy
francescoporcelli@alice.it.

*****Belhamra Med**
Doctor at the University of Biskra Algeria,
segmadz@yahoo.fr

Inventory of insects in Ziban oases Biskra, Algeria

Abstract

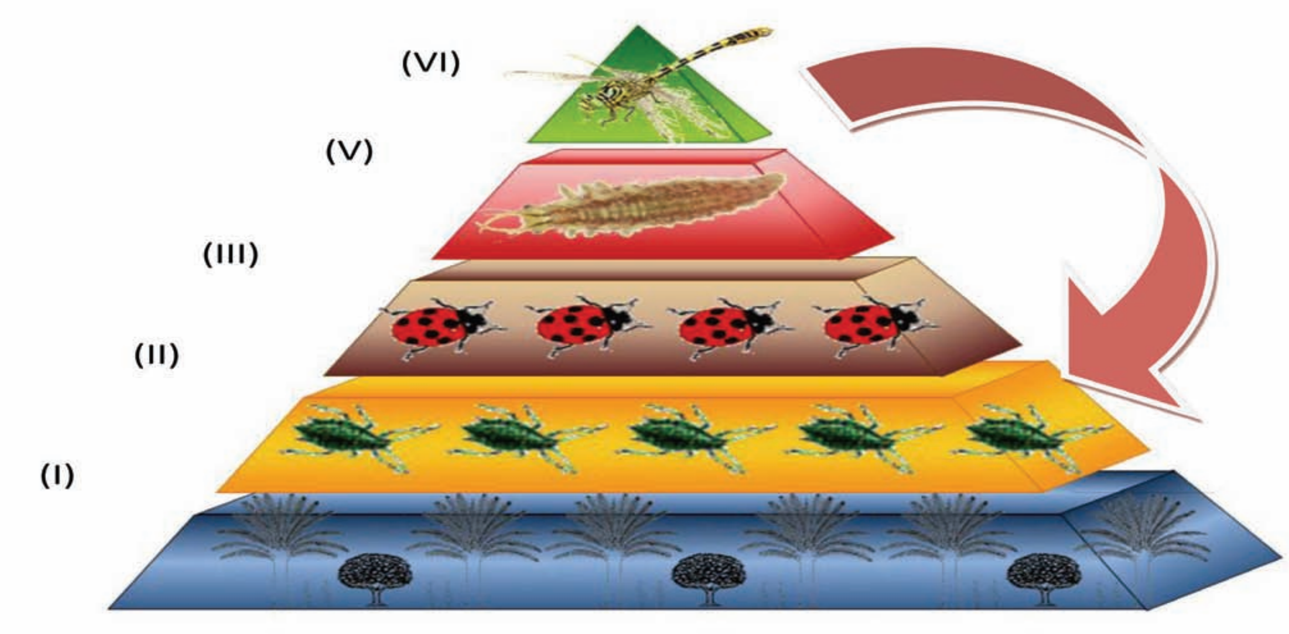
An inventory was carried out in five stations in the oases of Ziban, characterized by the high quality of their dates, in order to study the relationships between the oases ecosystem and insect fauna inhabiting it. Specimens were sampled through pitfall traps made with half plastic bottles containing Ethylene preservative solutions. A total of 115 species were collected, during 5 months of survey, belonging to 61 families and 17 orders in different classes: 12 into Insecta, 3 into Arachnida, one into Chilopoda and one into Isopoda. The most represented insect orders are Coleoptera (44.42%), Hymenoptera (20.86%) and the Lepidoptera (7.87%), all in the 3 major ecological groups of phytophagous (41.73%), zoophagous (36.52%) and omnivorous (21.73%) insects. Among the most important beneficial zoophagans collected in our oases ecosystem, there are predators (Coleoptera) and parasitoids useful in the bio-control; Diptera or Hymenoptera. Despite the large number of species collected and the relationship existing between the various ecological groups, our study is just the first step in the description of the oases entomofauna that deserves to be continued.

Keywords: Ecosystem, insects, Ziban oases, inventory, ecological groups.

Résumé

Dans les oasis des Ziban, cinq stations qui se caractérisent par la haute qualité des dattes produites, ont fait l'objet d'un inventaire, afin d'étudier les relations entre l'écosystème oasien et l'entomofaune qui y habite. Les exemplaires ont été échantillonnés en utilisant des pièges à fosse (pitfall traps) faits avec des demi-bouteilles en plastique contenant des agents conservateurs à base d'éthylène. Pendant les cinq mois d'inventaire, 115 espèces ont été collectées, appartenant à 61 familles et 17 ordres

Figure 6: Schematic description example of trophic chain in oases ecosystem



de différentes classes : douze Insecta, trois Arachnida, un Chilopoda et un Isopoda. Les ordres d'insectes les plus représentés sont les Coléoptères (44,42%), les Hyménoptères (20,86%) et les Lépidoptères (7,87%), tous compris dans les 3 principaux groupes écologiques des phytophages (41,73%), des zoophages (36,52%) et des omnivores (21,73%). Dans cet écosystème oasien, parmi les zoophages les plus importants il y a des prédateurs (Coléoptères) et des parasitoïdes très utiles dans la lutte biologique; les Diptères ou les Hyménoptères. Quoi qu'il en soit, en dépit du grand nombre des espèces collectés et les relations existantes entre les différents groupes écologiques, notre étude n'est que le début de la description exhaustive de toute l'entomofaune présente dans les oasis, qui mérite d'être poursuivie.

Mots clés: Ecosystème, insectes, oasis des Ziban, inventaire, groupes écologiques.

Introduction

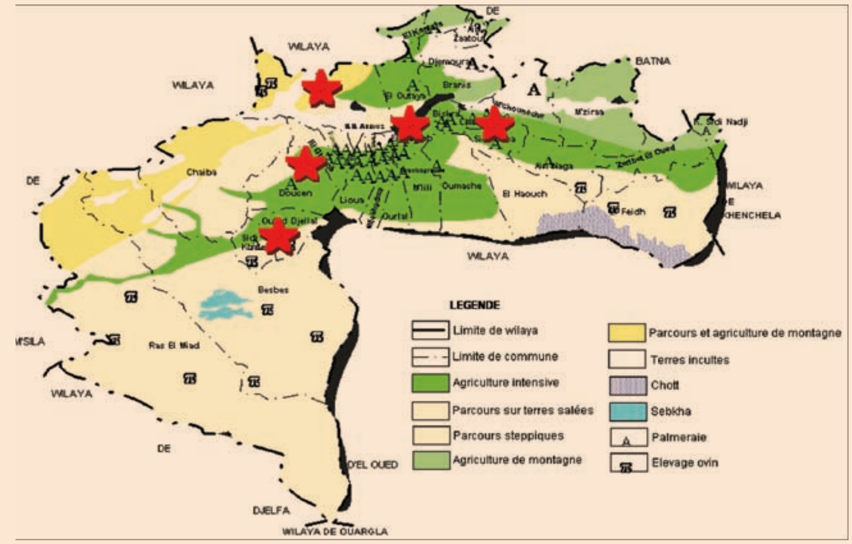
Insects are everywhere, in fact, there are more insects than any other type of animal on earth (Center for ecosystem survival, 1996). They are presumed to constitute about three-fourths (3/4) of all living animals on earth (Speight et al. 2008). Widely divergent estimates of insects in the world have been provided including up to 30 million species (Erwin 1982), 12.5 million (Hammond 1992) and 5-15 million (Stork 1997). More startling still is the simple fact that less than a million species have actually been described; and large majorities of the non- described species are in the third world. Existing knowledge on insect biodiversity is poor and no one knows exactly how many species of insects exist. It is important to have an idea about the living insects in each ecosystem and to be able to recognize the relationships existing between them.

In our oases ecosystem, hot dry climate, specialized insects found optimal conditions for their development. Their ecology is of crucial importance to oases ecosystem function and very often they are economically important as pests of crops, vectors of disease, beneficial components of food webs, and vital components of pollination systems.

Due to the lack of information -The latest inventory was carried out by LeBerre in 1978- on the species of insects present in the oases ecosystems in Algeria (Ziban), despite some scattered scientific observations conducted all over the country, there is still a shortage of informations to be completed on the inventory in Algerian oases ecosystem.

It is urgent today to face this alarming situation by having as 1st step an inventory, and alternative control methods of pests on date palm and also to take a account of the fragility of this microclimate ecosystem, by respecting the environment as well as the health of the consumers, since date marketing is often confronted with the

Figure 1: Map of study sites location.



problems of chemical residues, it is not a question of eradicating pests but of limiting their effect and damage.

Materials and methods

The study work was conducted at the oases of the "Biskra" wilaya located in the east of "Algeria", south of the Aurès Mountains.

The region of "Biskra" (Ziban) was selected as a site for this research because it is one of the most important areas of date production in "Algeria". The survey was conducted in five oases (Fig 1); Ain Ben Noui, Tolga, El Ghrous, Ouled Djellel and Sidi Okba which are known as the best oases producing high dates quality "Deglet Nour" in Algeria.

In order to have an idea about the species that can be present in those chosen cultivated area we used traps.

Pitfall traps were used for collecting specimens (Fig 2). These traps were made up of plastic containers with holes in the bottom, with a cover of wire mesh and stones placed approximately 2,5cm above the plastic container in order to protect the traps from rainfall and prevent mammal species from entering.

Four (4) traps were used per site starting from the first of February until the end of June and were visited every week. The location of these traps is probably best in four opposite directions in order to cover all the insect movement in each station. And in situations where ground vegetation is minimal or relatively rare traps can be left unattended for a week or more without deleterious effects up on any specimens captured (Greenslade 1973).

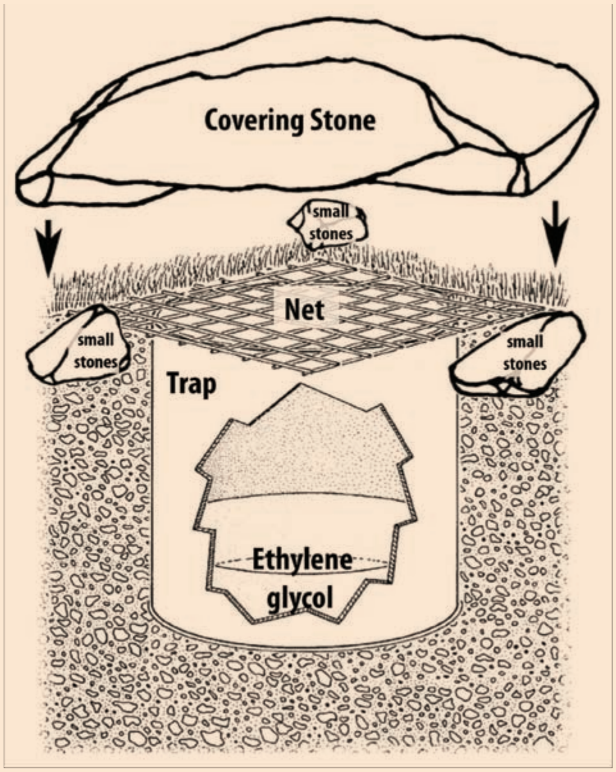
The captured insects were collected weekly and transferred to the laboratory, where they were counted, and examined. Once back in the lab, insects were sorted and pinned or point mounted. After all of the insects were pinned, they were then identified to order, family and in the major cases in species. Then they were given collection labels for the storage on boxes.

For our survey, the identification of insects took place mainly after capture in the laboratory under the microscope or magnifier. However, some species require further examination to be identified. This is a task for taxonomists; nevertheless an identification of oases insects up to the genus or species level was made at the University of Biskra and C.R.S.T.R.A based on their reference collection and using books (Chinery 1993) and finally corrected by the professor porcelli. Some of the prepared and identified species were sent to Algerian entomologist to confirm identification. Once insect is in a position facilitating the study of external characters, it is essential the label (Phillip et al. 1981), to associate the word Information regarding the origin and identity the specimen, This information is written on one two or three labels pinned under the specimen or on a special paper for insects in alcohol and on slide. Pinned specimens are kept in specially made insect store-boxes, lined at the bottom with paper-covered cork and having removable glass lids.

Results and discussion

Consisting of 20 samples/site, that is to say 100 samples/5 sites. The pitfall traps collection method yielded a total of 1 524 arthropods. From the total number of arthropods (1 524 individuals) collected from the five (5) sites (Fig 3); the mean number of specimens sampled (per trap) was the highest for the El-Ghrous station with 352 specimens, then for Tolga with 335 specimens, in the 3rd position with 333 specimens was Ain Ben Noui site, in the fourth position with 257 specimens came Ouled djellel site and finally Sidi Okba site with 247 specimens. It was proposed that vegetation has a threefold influence on the diversity (species-richness) its effects on microclimate, carrying capacity and structural complexity of

Figure 2: Pitfall trap scheme.



the habitat (Greenslade and Greenslade 1977).This variation on number maybe explained by the diversification on flora during the spring period that our insects used as habitats to search for prey for an alternative source of food, for microclimate more favorable than the cultivated field or to find a refuge or hibernation site and for some, an undisturbed site for larval development (Maisonhaute 2009).

The number per order was the highest for the Coleoptera order with 677 specimens; then the Hymenoptera order with 318 specimens, followed by the Lepidoptera order with 120 specimens. The other orders are represented by 3 to 26 specimens. Ye and Li (2003) carried out similar work in studies conducted in Singapora in three different ecosystems, concluding that the dominant order found in their pitfall traps were especially from the insecta class (Coleoptera, Hymenoptera, Lepidoptera,…). Thus, the design of the pitfall trap could be based towards these arthropods. Another possible explanation for such an observation may be explained by the functional role of the crawler arthropods (Didham et al. 1998). Pitfall trapping, as the name implies, involves the capture of ground surface-active arthropods that fall into a pit-like trap sunk into the ground. Moreover, the abundance, richness and diversity of beetles (Coleopteran) increased with increasing diversity of weeds (Burgio et al. 2006).

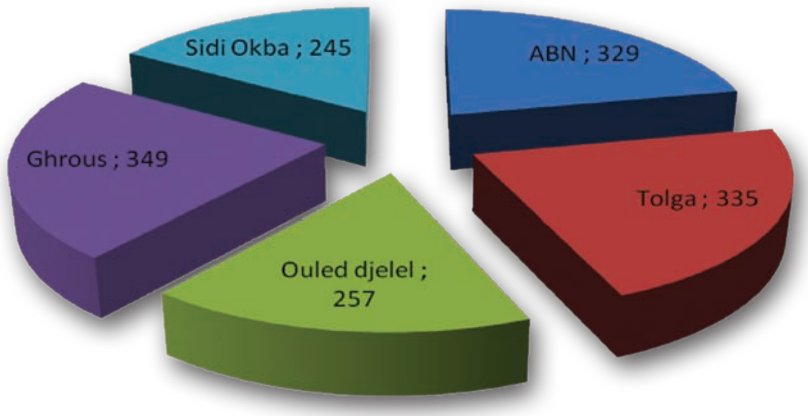
Also for those obtained results, pitfall traps have been shown to be highly efficient in the studies of the occurrence and activity of invertebrates active on the ground surface, especially beetles and spiders (Greenslade 1971 and Luff 1975). In addition Spence and Niemelä (1994) and Niemela (1996), examined variety of methods (5 different methods) of sampling, in general they found that pitfall trapping caught the large bodied individuals (Coleoptera and scorpions) whereas smaller sized species were caught in the litter washing.

The efficiency of the pitfall traps used played an important part in the experimental set-up. Factors such as the size (20 cm of diameter), material of the cup (plastic bottles) and depth of trap (20 cm) may be based towards certain arthropods that are too big to be captured by this type of traps (Luff 1975; Work et al. 2002), we can give (Lepidoptera and Odonata) as examples. Whereas others like Maehara (2004) and Scudder (2000) disagree with this explanation and they thought that the efficiency of pitfall traps was correlated with the density of beetles, but not to the size of used containers. Generally, if a single trap type is used to sample a fauna over a period of time, apparent dominance or relative abundance of the species caught will depend on its activity, density and the extent to which it is caught by that trap type (Luff 1975). In our case this may be one of the reasons which explain the relative abundance of certain arthropods (Coleoptera, Orthoptera and Diptera orders) present in large number in certain oases (Spence and Niemela 1994).

In total seventeen (17) orders of Arthropods were identified from the collection of 115 species, including 12 orders of class Insecta, three (3) orders of the class Arachnida, one order of class Chilopoda and one order of class Isopoda (Table 1).

The most frequently collected individuals and the individuals collected in the greatest quantities were found in the insecta class (Fig 4). In total, 12 orders of insecta class were

Figure 3: Total collected specimens per stations.



identified including 51 families and 103 species.

For all stations we found that, Coleoptera order with 44,42% represented the highest percentage, Hymenoptera with 20,86% and Lepidoptera represented with 7,87%, are the three most abundant groups of arthropods collected. Where Coleoptera order in Carabidae, Tenebrionidae and Coccinellidae families. Comparing to the results reported by Baumgardner (2007), who found that the collection was dominated by the order Coleoptera (beetles) at 41% of the collection and 287 total specimens. This is somewhat higher than expected since it is estimated that 33% or 1/3 of all insect species worldwide are of the order Coleoptera.

The next most numerous order after Coleoptera was Hymenoptera order in the Vespidae, Apidae and Formicidae families. In third (3rd) position order Lepidoptera in the Pieridae and Nymphalidae families, for the order Heteroptera we have both the Miridae and Pentatomidae families and so our results agree with those of Winchester and scudder (1993) who tried several methods to capture insects' specimens and they found that some of them are mostly presents in pitfall traps type.

The others orders were represented by few species belonging to one to two families respectively; Neuroptera (Chrysopidae) and Dermaptera (Forficulidae; Labridae).

For class Arachnida, orders Araneae (Lycosidae), Solfugidae (Daesiidae) and Scorpions (Scorpionidae) are the three greatest orders represented by several species.

From the 115 species, six (6) of them are listed by the Ministry of Land, Environment and Tourism as protected species in Algeria: Apis melifera; Xylocopa violacea, Syrphus sp, Mantis religiosa, Chrysopa carnea and Polistes gallicus (M.A.E.T 2009 at press).This is may be due to their importance as predator or parasitic species that have an effect on the regulation of crop pests (Mantis religiosa, Chrysopa oculata) or a beneficial effect on the environment (Apis melifera).

Many of the 115 recorded and identified species are phytophagous; overall there are species that are predatory and parasitic (36, 52%), but we are aware of the phytophagous (41,73%) because they often compete with us for cultivated plants (Fig 5).

Among the sixty-one (61) families collected there are a number of serious plant pest as for the order of Homoptera (Aphididae), Lepidoptera (Tuta absoluta) which is a newly recorded species in 2009 on greenhouse tomatoes. Heteroptera (Nezara viridula) and also Orthoptera (crickets) are generally abundant, widespread throughout the country and recognized as excellent indicators of the integrity of terrestrial ecosystems.

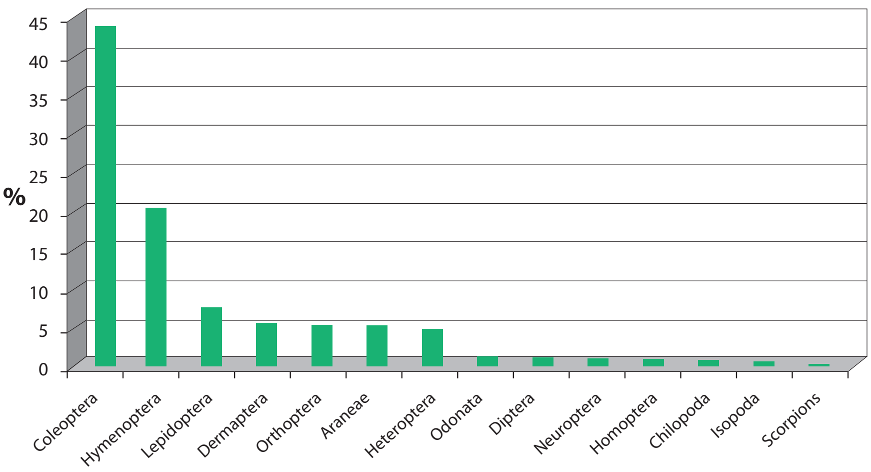
Because not all insects are pests, they are also beneficial. Zoophagous species can be divided in two major groups the beneficial flies include parasitic like the Tachinid flies and predators like the Syrphid fly and coccinellidae.

Among the most important Zoophagous collected in our oases ecosystem and that are, beneficial (predators) insects are ladybird beetles (Coccinella septempunctata L., 1758), lacewings (Chrysopa oculata, say 1839), praying mantids (Mantis religiosa, L., 1758) and dragonflies (Sympetrum sanguineum, Muller, 1764). The parasitic species are Diptera fly (Peleteria varia fabricius, 1794) and Hymenoptera (Megascolia maculata Drury, 1773).

The relationships between pests and natural enemies (parasites, predators) are extremely complex, they have proven difficult to analyze, and in many cases are still poorly understood. Actually, some zoophagous insects are needed to keep the natural enemies population alive, by setting up; insect functions, insect' life cycles and their natural enemies. The third group that was found in our pitfall traps (oases ecosystem) is the polyphagous group that inclodes the Coleoptera (Pimelia sp), beetles (Brachinus explodens, Duftschmid 1812) and ants (Messor Barbarus, L.).

Communities are groups of organisms (populations) that maintain persistent associations with each other. In our case, we dedicate that there are

Figure 4: Total collected specimens per order.



relationships between organisms living in the same agro ecosystem that can be modified once it is disrupted by the unavailability of one link. Predators and prey occupy different trophic levels, whereas parasites and hosts sometimes exist on the same resource plants, if they compete for host resources rather than consume host tissue (Raffel et al. 2008). The large number of predatory Coleoptera, genus Coccinellidea, present in all visited stations during the period between March and May with the role of regulator of Aphids population, can be eaten by several others insects that could be present in and around the oases (Chrysoperlea oculata). The Libellulidae family is well represented in our oases ecosystem by the dragonfly that has major role in the regulation of predators' species. In addition the presence also of the Araneae in the tow oases station Tolga and El Ghrous is very attractive and can explain the species diversification in this region. Starting from the information collected during our survey, we can build our chain in the oases ecosystem in this way.

Integrated Pest Management is an approach to pest management designed to manage pests and diseases with as little damage as possible to people, the environment and beneficial organisms (Dufour 2001).

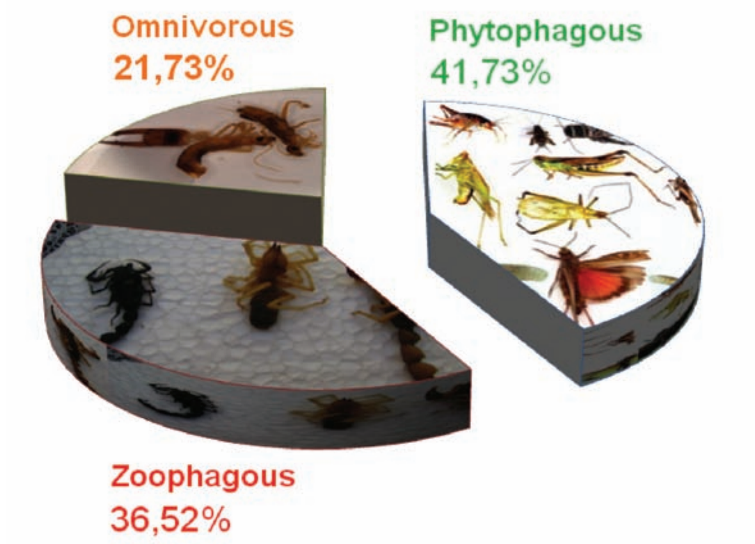
The goal of IPM is to maintain a balanced ecosystem (a healthy environment) which results in high economic, environmental, and social benefits (Dufour 2001). The objectives of ecosystem analysis are to make decisions about what to do to manage the oases ecosystem and to achieve the goals of IPM.

An IPM program was applied in oases ecosystem by Doumindji and Doumindji-Metiche in 1990, and they had results of 45.3% success with the release of ooparasite Trichogramma embryophagums as a parasite of Ectomylois ceratonae Zeller, in an oasis ecosystem in south-west Algeria. Another work was carried out in some oases of south-east Algeria where I.N.P.V. released some sterilized males of Ectomylois ceratonae Zeller in 1999 and obtained a significant reduction in worm infestations of dates.

Another experiment of Quinlan and Dhouibi (2008), that consist on field releases of biological control agents against date moth, other than B.t., include the Bracon hebetor and other parasitoids and predators has great efficiency but still under search in field.

Some of results were achieved in oases ecosystems of the Algerian south-west in 2008 by Idder and Pintureau who used lady bird (Stethorus punctillum) as a predator that played an important role in the control of the mite O.afrasiaticus. Other predators,

Figure 5: Percentage of ecological groups.



however, are present in Algeria; they will have to be tested in order to establish a method of biological control suited to sufficiently protecting the palm plantations against O. afrasiaticus, and other pest which infest our crops.

Finaly, this inventory is a first approach in any event and is a tool for setting up an IPM program within oases ecosystem based on the correct identification of collected species and the ecological role that play in trophic food chain.

This study will allow the state to obtain a list for the conservation and classification of insects through the creation of insectariums for the conservation of the collected insects, that will prevent the entry of large numbers of new species in the future, such as Rhynchophorus ferrugineus and Phoenicoccus marlatii that can affect our oases ecosystem (Date palm).

References

Baumgardner, M.C. 2007. Forest fragmentation and its effects on arthropod populations in small vs. large forests in northwest Ohio. Master of Science Thesis. The University of Bowling Green State.

Burgio, G., Ferrari, R., Boriani, L., Pozzati, M. and Lentern, J.V. 2006. The role of ecological infrastructures on Coccinellidae (Coleoptera) and other predators in weedy field margins within northern Italy agro-ecosystems. Bulletin of Insectology, 59 (1): 59-67.

Center for Ecosystem Survival. 1996. CES Teacher Guides. Ecosystem and Insects. San Francisco. Mississippi. Advice on online citation formats [en ligne]. Disponible à ecosystem@sfsuedu.www.savenature.org/images/pdfs/ecoandinsects.pdf

Chinery, M. 1993. Collins guide insects of Britain and Northern Europe. 3rd ed of (1973). Harper Collins publishers (London).

Didham, R.K., Hammond, P.M., Lawton, J.H., Eggleton, P. and Stork, N. 1998. Beetle species responses to tropical forest fragmentation. Ecological Monographs, 68(3): 295-323.

Doumandji-Mitiche, B. and Doumandji, S.E. 1990. Essai de lutte biologique contre la Pyrale des Caroubes Ectomyelois ceratoniae Zeller, (Lep., Pyralidae) par utilisation de Trichogramma embryophagum (Hym.,Trichogrammafidae) à Ouargla. In: Dollé V. and Toutain G. (eds). Les systèmes agricoles oasiens. IAMM, Montpellier, pp. 183. Options Mediterranieennes, A11. Advice on online citation formats [en ligne]. Disponible à http://ressources.ciheam.org/om/pdf/a11/CI901501.pdf.

Dufour, R. 2001. Bio-intensive integrated pest management (IPM) Advice on online citation formats [en ligne]. Disponible à http://attra.ncat.org/attra-pub.PDF/ipm.pdf

Erwin, T.L. 1982. Tropical forests: their richness in Coleoptera and other arthropod species. The Coleopterists Bulletin, 36(1):74-75.

Greenslade, P.J.M. and Greenslade, P. 1971. The use of baits and preservatives in pitfall traps. Journal of the Australian Entomology, 10(4): 253- 260.

Greeenslade, P.J.M. 1973. Sampling ants with pitfall traps, digging in effects, Insectes Sociaux, 20(4): 343-353.

Hammond, P. 1992. Species inventory. In: Groombridge B. (ed.). Global biodiversity. Status of the earth's living resources. London: 17-39.

Luff, M.L. 1975. Some features influencing efficiency of pitfall traps. Oecologia, 19(4): 345-357.

M.A.T.E.T, (at press): Projet de décret exécutif fixant la liste des espèces animales non domestiques protégées, Ministère de l'Aménagement du Territoire, de l'Environnement et du Tourisme. Alger.

Maehara, T. 2004. The efficiency of pitfall traps in relation to a density and activity of the carabid beetles, Carabus insulicola insulicola chaudoir (Coleoptera: Carabidae), under controlled population density. Japanese Journal of applied Entomology and Zoology, 48 (2): 115-121.

Maisonhaute, J. É. 2009. Quand le

paysage influence les ennemis naturels. Bulletin de la Société d'entomologie du Québec Antennae, 16(2) : 3-7.

Neimelä, J.K. 1996. From systematic to conservation-Carabidologists do it all. Annales Zoologici Fennici, (33): 1-4.

Niemelä, J.K. and Spence J.R. 1994. Distribution of forest dwelling carabids (Coleoptera): spatial scale and the concept of communities. Ecography, 17 (2): 166-175.

Phillip, E., Loroy, H. and George, E. 1981. Pinning and labeling insects for KANSAS 4. H. Entomology Collections Cooperative Extension Service. KANSAS. State University, Manhattan.

Quinlan, M.M. and Dhouibi, M.H. 2008. Annex 5. Potential markets for date moth SIT in date production regions. In: FAO and IAEA. Model business plan for a sterile insect production facility. Vienna, Austria, pp 285-304.

Raffel, T.R., Martin, L.B. and Rohr, J.R. 2008. Parasites as predators: unifying natural enemy ecology. Trends in Ecology and Evolution, 23(11): 610-618.

Scudder, G.G.E. 2000. Pifall trapping. Ecological Monitoring and Assessement Network. British Columbia, Canada

Speight, M.R., Hunter, D.M. and Wait, D.A. 2008. Ecology of insects 2nd edition, Black well.

Spence, J.R. and Niemelä, J.K. 1994. Sampling Carabid assemblages with pitfall traps: the madness and the method. The Canadian Entomologist, (126): 881-894.

Stork, N.E. 1997. Measuring global biodiversity and its decline. In: Reaka-Kudla M., Wilson D.E. and Wilson E.O. (eds). Biodiversity II: understanding and protecting our biological resources. Washington D. C.: 41-68.

Winchester, N.N., and Scudder, G.G.E. 1993. Methodology for sampling terrestrial arthropods in British Columbia. Resources Inventory Committee (RIC).

Work, T.T., Buddle C.M., Korinus, L.M. and Spence, J.R. 2002. Pitfall trap size and capture of three taxa of litter-dwelling Arthropods: implications for biodiversity studies. Environnement Entomology, 31(3): 438-448

Ye, M.S. and Li, D. 2003. The effects of forest fragmentation on arthropod diversity. Advice on online citation formats [en ligne]. Disponible à http://www3.ntu.edu.sg/eee/urop/congress2003/Proceedings/abstract/NUS_FoS/Life%20Sciences/Ye%20Meishan.pdf

Figure 2: Total collected species by pitfall traps in oases ecosystem

Class	Order	Family	Species	Ecological role A	Ecological role B	Ecological role C	Months 2	Months 3	Months 4	Months 5	Months 6
INSECTA	COLEOPTERA	Cetoniidae	*Tropinota (epicometis) hirta* (Poda, 1761)		X			■	■	■	■
			Tropinota squalida (Scopoli, 1783)	X				■	■	■	■
		Coccinellidae	*Psyllobara vigintiduopunctata* (L, 1758)	X					■	■	
			Chilocorus bipustulatus (L, 1758).		X					■	■
			Stethorus punctillum		X					■	■
			Coccinella septempunctata (L, 1758)		X				■	■	■
		Buprestidae	*Agrilus scythicus*		X						■
		Tenebriooidea	*Pimelia payraudi* (Latreille, 182)	X	X			■	■	■	■
			Diaperis maculata Olivier 1791						■	■	■
			Gonocephalum granulatum nigrum (Küster, 1849)		X		■	■	■	■	■
			*Blaps sp (*Fabricius, 1775)		X		■	■	■	■	■
			Coelocnema obesa (LeConte, 1851)							■	■
		Aderidae	*Anidorus sanguinolentus* (Gotz, 1783)		X					■	■
		Carabidae	*Calosoma inquisitor* (L, 1758)			X		■	■	■	
			Carabus sp.		X	X	■	■	■		
			Brachinus explodens (Duftschmid 1812)		X				■	■	■
			Lophyra flexuosa (Fabricius, 1787)		X			■	■	■	■
			Anthia duodecimguttata		X			■	■	■	
		Dasytidae	*Psilothrix viridi coerulea* (Geoffroy, 1758)		X			■	■	■	
		Scarabaeidae	*Macrodactylus subspinosus* (F)		X			■	■	■	■
			Anomala marginata (F).	X							■
		Curculionidea	*Larinus sp*	X			■				
			Liophloeus tessulatus (Müller, 1776)		X					■	■
		Chrysomelidae	*Clytra* sp.	X				■	■	■	
		Meloidae	*Mylabris bipunctata* (L, 1767)					■	■	■	
	HYMENOPTERA	Vespidae	*Polistes gallicus L; .*	X	X		■	■	■	■	■
		Colletidae	*Colletes sp*	X				■	■		
		Megachilidae	*Megachile rotundata*	X	X			■	■		
		Ichneumonidae	*Dusona sp*		X			■	■		
			Netelia sp.		X			■	■		
		Scoliidae	*Megascolia maculata* (Drury, 1773)	X	X			■	■		
		Apoidea	*Apis mellifera* L	X				■	■	■	
			Xylocopa violacea (L, 1758)	X				■	■		
		Formicidae	*Formica incerta*	X			■	■			
			Camponotus sp			X	■	■	■	■	
			Messor barbara (L)			X		■	■	■	
		Myrmicinae	*Solenopsis invicta Buren*		X			■	■		
		Pompilidae	*Arachnospila sp.*		X			■	■	■	
		Braconidae	*Phanirotoma sp*		X					■	■
	HEMIPTERA	Pentatomidae	*Codophila varia* (Fabricius, 1787)	X						■	■
			Nezara viridula (L, 1758).	X						■	■
			Perillus bioculatus (Fabricius)	X						■	■
			Acrosternum heegeri (Fieber, 1861)	X						■	■
			Dolycoris baccarum (L 1758).	X						■	■
			Eurydema ornata	X						■	■
			Ancyrosoma leucogrammes	X					■	■	
			Pentatoma rufipes (L, 1758).	X	X				■	■	■
			Carpocorpuris purpureipennis (DeGerr 1773)	X					■	■	
		Miridae	*Stenotus binotatus* (Fabricius 1794)	X				■	■	■	
		Lygaeividae	*Oxycarenus lavaterae* (fabricius, 1787)	X			■	■	■		
		Cydnidae;	*Sehirus luctuosus* (Mulsant & Rey, 1866)	X						■	■
		Stenocephalidae	*Dicranocephalus Albipes* (Fabricius, 1781)		X		■	■	■		
	DIPTERA	Syrphidae	*Sphaerophoria scripta* (L.,1758)		X		■	■	■		
			Cheilosia variabilis (Panzer, 1798).					■	■		
			Syrphus vitripennis (Meigen, 1822)		X		■				
			Melanostoma mellinum (Li, 1758).		X			■	■		
		Tipulidae	*Tipula paludosa*				■	■	■		
			Dusona sp	X	X			■	■		
		Bombyliidae	*Systoechus vulgaris* (Loew, 1863)	X	X			■	■		
		Asilidae	*Neoitamus sp.*	X	X				■	■	
		Berytidae	*Metatropis rufescens* (Herrich-Schäffer, 1835)			X			■	■	
		Tachinidae	*Campsilura concinnata* Meig		X					■	■
			Peleteria varia (Fabricius, 1794)		X		■				
		Sphingidae	*Hyles lineate* (Fabricius, 1775)	x			■	■	■		
		Noctuidae	*Mythimna vitellina* (Hübner, 1808).	X						■	■
			Lacanobia aliena (L, 1767)	X						■	■
			Orthosia gothica (L, 1758)	X						■	■

	LEPIDOPTERA	Nymphalidae	*Pararge aegeria* (L, 1758).	X		
			Araschnia levana (L, 1758).	X		
			Vanessa cardui (L, 1758).	X		
			Danaus plexippus (L, 1758)	X		
		Pieridae	*Pontia daplidice* (L, 1758)	X		
			Pieris rapae (L, 1758)	X		
			Lycaena helle (Denis & Schiffermüller, 1775).	X		
			Euchloe simplonia (Freyer, 1829).	X		
		Lycaenidae	*Glaucopsyche melanops*(Boisduval, 1828).	X		
			Polyommatus semiargus (Rottenburg, 1775).	X		
		Sphingidae	*Macroglossum stellatarum* (L, 1758)	X		
		Geometridae	*Idaea fuscovenosa* (Goeze, 1781)	X		
		Gelechiidae	*Tuta absoluta* **(**Meyrick**,** 1917)	X		
			Euchloe (Elphinstonia) lessei zagrosicus	X		
	HOMOPTERA	Aphididae	*Myzus percecae* (Sulzer)	X		
			Rhopalosiphum podi (L)	X		
			Hyadaphis foeniculi (Passerini, 1860)	X		
		Diapanosiphinae	*Therioaphis trifolii* (Monell)	X		
	ODONATA	Libellulidae	*Sympetrum sanguineum* (Muller, 1764)		X	
			Sympetrum vulgatum **(**L, 1758)		X	
		Coanagrionidae	*Coenagrion sp*		X	
			Ischnura elegans (Vander Linden, 1820)		X	
	DERMAPTERA	Labidridae	*Labidura riparia* (Pallas, 1773).			
		Forficulidae	*Forficula auricularia* (L, 1758)		X	
	EPHEMEROPTERA	Baetidae	*Clpeon dipterum* (L 1761)		X	
	NEUROPTERA	Chrysopidae	*Chrysopa oculata* (say 1839)		X	
	ORTHOPTERA	Acrididae	*Chorthippus sp.*	X		
			Aiolopus strepens (Latreille,. 1804)	X		
			Acrida turrita (L, 1758).	X		
			Chorthippus biguttulus (L, 1758).	X		
			Melanoplus bivittatus			
			Locusta migratoria (L.)			X
			Acrotylus insubricus(Scopoli, 1786).	X		
		Gryllidae	*Gryllus bimaculatus* (De Geer, 1773)	X	X	
	MANTODEA	Mantidae	*Mantis religiosa* (L, 1758)		X	
			Sphodromantis viridis (Forskal 1775)		X	
ARACHNIDA	**ARANEAE**	Lycosidae	*Trochosa terricola* (Thorell, 1856)		*X*	
		Dysderidae	*Dysdera crocata* C. L. Koch, 1838		*X*	
		Thomisidae	*Tomisus sp.*		*X*	
		Aranaidae	*Agalenatea redii*, 1763		*X*	
			Argiope bruennichi (Scopoli, 1772)			
			Argyope lobata (Pallas, 1772)			
		Theridiidae	*Latrodectus sp*		*X*	
	SOLFUGIDAE	Daesiidae	*Syndaesia sp*			
	SCORPIONS	Buthidae	*Buthiscus bicalcaratus* (Birula, 1905)		*X*	
		Scorpionidae	*Androctonus bicolor* (Hemprich & Ehrenberg, 1828)		*X*	
ISOPODA	**ONISCIDAE**	Porcellionidae	*Porcellio scaber* (Latreille, 1804)			*X*
CHILOPODA	**GEOPHILOMORPHA**	Scutigeridae	Centipede			*X*