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SOME FEATURES OF IMPORTANT TAXA OF SOIL MESO-FAUNA IN AN AFRO-MEDITERRANEAN COASTAL DESERT. I.-GENERAL CONSIDERATIONS OF SOIL MESOFAUNA IN AGRO-ECOSYSTEMS.

By

Dr. SAMIR I. GHABBOUR and SAFWAT H. SHAKIR

Dept. of Natural Resources. — Inst. of African Research & Studies

Cairo University, Giza (Cairo), Egypt

Note : This paper is based on an original text that was presented *in absentia* at the International Meetings, Soil, Vegetation, Fauna, Safeguard and Restoration of Environmental Equilibrium, and Regional Planning in the Mediterranean Region. I–Colloquy on the Relationship Between Vegetation and Fauna, Palermo, Italy, 6–11 October, 1980, and organized by the Italian National MAB Committee, Ministry of Agriculture and Forestry, the Regional Government of Sicily, and UNESCO.

SUMMARY

1— Nine agro–ecosystems in the Mariut coastal desert region west of Alexandria were selected to study the changes brought about by dry land farming and irrigated agriculture practices on populations of soil meso–fauna. These sites are classified as follows :

a Rain–fed agro–ecosystems :

This paper is dedicated to the eminent Egyptian plant ecologist Prof. M.KASSAS, Fac. of Science, Cairo Univ., President of IUCN, President of Egyptian National MAB Committee who pioneered and encouraged integrated ecosystem studies in Egypt, in honour of his sixtieth birthday, July 1981.

i- Coastal areas :

1— coastal fig at Omayed

2— coastal fig at Gharbaniat

3— coastal almond at Gharbaniat

4— coastal barley at Gharbaniat

ii- Inland areas :

5— "Haj Ali" olive farm at Burg El-Arab

6— "Rest House" farm at Burg El-Arab

b- Agro-ecosystems irrigated by Nile water :

7— "Old" vine farm at Gharbaniat

8— "New" vine farm at Gharbaniat

9— Field crops farm at Burg El-Arab, with maize and clover in rotation

2— Sampling in these farms started in spring 1977 till autumn 1978. In every site 10 quadrats (50 × 50 × 60 deep cm) were taken in five seasons (total of 50 quadrats in each site). The sieving method (through a 1-mm mesh sieve) was used in the first two sites, while hand-picking was used in the other sites. The collected animals were sorted in the lab under a binocular microscope and preserved in 70% alcohol or 4—6% formalin and weighed later.

3— The density of soil mesofauna in irrigated agro-ecosystems is almost double that in rain-fed ones (46.8 against 24.2 /m2), while biomass in irrigated agro-ecosystems is only 10% higher than in rain-fed farms (1464 against 1331 mgm/m2). Densities under barley (rain -fed) are lower than under rain-fed orchards. Similarly, densities under irrigated field crops are lower than under irrigated orchards (vine). These are 9.4 under barly against 11.7—49.6 under rain-fed orchards and 43.3 against 45.6—51.6/m2 in the latter case.

4— The dominant taxa in all nine sites taken together are : Formicidae, Tenebrionidae and spiders. Dominant taxa in rain-fed agro-ecosystems are : Tenebrionidae, Formicidae and Scarabaeidae, while in irrigated agro-ecosystems they are : earthworms, Formicidae and spiders.

5— It is not possible to arrange the nine agro-ecosystems on a single line gradient of classification according to the degree of artificialization based on the findings of the present investigation on population density and biomass of soil mesofauna. Rather, a dendritic classification is more realistic and appropriate.

INTRODUCTION

The Mariut coastal desert west of Alexandria is considered a natural outlet for the growing population of Egypt. Several agricultural expansion projects are being implemented there to increase the irrigated area from 4,000 ha to 242,000 ha, taking advantage of the water stored in the High Dam Lake at Aswan (UNDP/FAO 1971, Ehlers 1979). Various types of dry-land farming and irrigated agriculture thus co-exist now (Ayyad and Ghabbour 1977). These various forms of traditional and modern agriculture affect the environment drastically, and, as an integral part of the land and soil systems, the soil fauna as well, and are superimposed on edaphic and climatic factors.

The geomorphology of the Mariut coastal region is characterized by a number of ridges parallel to the sea coast and enclosing a number of longitudinal depressions which may be saline or not according to level of water table. Four of these ridges are prominent : two north of the Mariut Salt Marsh, and two to the south of it (Fig. 1). Rainfall is about 180 mm/year, but may fluctuate from 50 to 300. Soils are calcareous of sandy to sandy loam texture. A detailed description of the area and its ecology was given by Ayyad and Ghabbour (1977). The main crops of rain-fed agriculture are barley, figs and olives, while irrigation serves vine-yards, or annual field crops such as maize, clover, or wheat. Before the definitive crop is cultivated in these government managed farms, the reclaimed land is put under alfalfa for some years to improve soil properties.

The present work focusses on some features of important taxa of soil fauna in a selection of agro-ecosystems of this region.

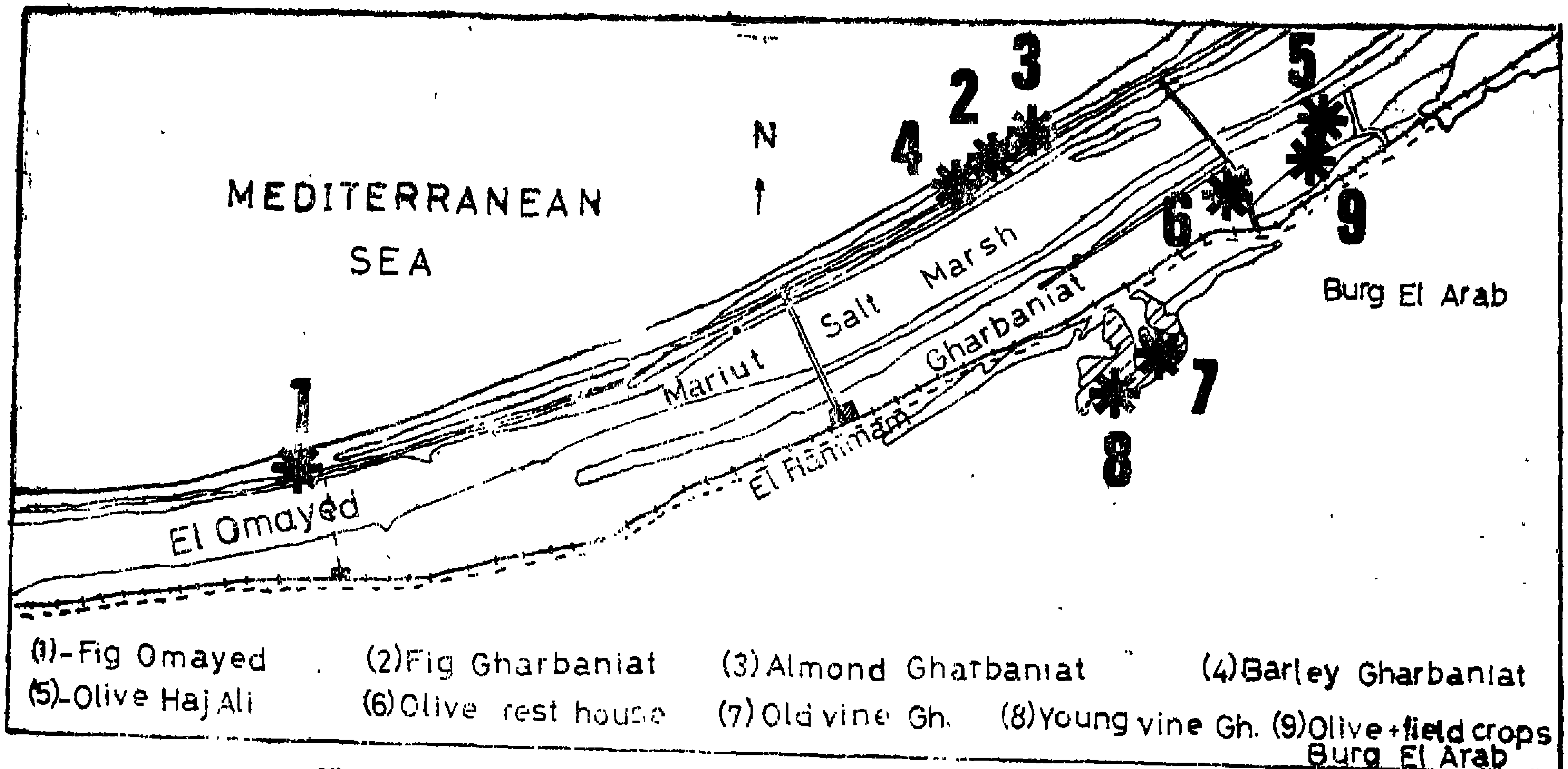

Fig. 1— Locality map of the Mariut coastal region showing the sites of the nine selected agro-ecosystems : *1*–**fig at Omayed,** 2–fig at Gharbaniat, 3–almond at Gharbaniat, 4–barley at Gharbaniat, 5–olive "Haj Ali" at Burg El-Arab, 6–olive ,'Rest House" at Burg El-Arab, 7–"old" vine at Gharbaniat, 8–"new', vine at Gharbaniat, 7- field crops farm at Burg El-Arab (maize and clover rotation).

MATERIAL and METHODS

1. *Experimental Sites.*

Fig. 1 shows the area of study and the various agro-ecosystems of the Mariut region selected for the present investigation. The nine selected sites represent two types of agro-ecosystems : 6 rain-fed and 3 irrigated. Four of the rain-fed farms are coastal (i.e., north of the Salt Marsh), and two are inland (i.e., south of the Salt Marsh), while all three irrigated farms are naturally irrigated, because the irrigation water does not cross the Salt Marsh. Farm no. 1 (Fig. 1) is rain-fed fig on the littoral sand dune, or first ridge, at Omayed. The soil fauna under shrubs of the natural vegetation in this dune system was studied by Ghabbour, Mikhail and Rizk (1977). Farm no. 2 is rain-fed too but in the non-saline depression between the first and second ridges. Farms no. 3 (almond) and 4 (barley) are also rain-fed and are adjacent to farm no. 2 in the depression, at Gharbaniat. Farm no. 5 is rain-fed olive on the southern slope of the third ridge on the site of an ancient *karm,* which is an artificial rectangular ridge erected in Graeco-Roman times to harvest rain water (Kassas 1972). This farm will be called "Haj Ali" farm after its owner. Farm no. 6 is an old (established in 1935) and neglected rain-fed olive farm in the same depression (between the third and fourth ridges), near the rest house at Burg El-Arab, and will therefore be called the "Rest House" farm. Farms no. 7 and 8 are "old" (established in about 1971) and "new" (established about 1974) irrigated vine farms in the Mariut frontal plain, north of the fourth ridge, at Gharbaniat. The soil fauna under the shrub *Thymelaea hirsuta* of the natural vegetation in this plain was studied by Ghabbour and Shakir (1980 a). Farm no. 9 is adjacent to farm no. 5, on the same slope and also in the site of a *karm,* but is irrigated. It was formerly a similar rain-fed olive farm but when irrigated and planted with annual field crops (maize and clover, *Trifolium alexandrinum*) the olive trees deteriorated and were finally uprooted in July 1979. A detailed description of these sites will be given elsewhere (Ghabbour and Shakir, in preparation).

2. *Sampling and Extraction of Soil Mesofauna* :

The term mesofauna is used here in the sense of invertebrate animals larger than ca. 1 mm, as used by Ghilarov (1941), Ghilarov and Arnoldi (1969), Rapoport and Tschapek (1967), Wallwork (1976), Ghabbour, Mikhail and Rizk (1977), among others.

Sampling began in spring 1977 and continued till late autumn 1978. In every site samples were taken in five seasons, ten in each season, making a total of 50 samples per site. Quadrats (50 × 50 × 60 deep cm.) were selected at random along a line within the center of the farm (between trees or shrubs in order to avoid damaging the roots). Ten quadrats were laid in each season. Soil extracted from the excavated pit was either sieved through a 1 mm mesh sieve (Ghabbour, Mikhail and Rizk, 1977) in rain-fed farms (except the two olive farms) where soil is loose and friable, or was broken into smaller lumps and the animals hand-picked, in the irrigated farms and the two olive farms where soil is massive and consolidated(and cannot be made to pass through the meshes of the sieve) .After sieving or hand-picking the animals were kept in tight polyethylene bags and taken to the lab for sorting under a binocular microscope (× 100). Each animal found was preserved in 70% alcohol or, in some cases, 4—6% formalin. They were later weighed and their weights therefore refer to alcohol- or formalin-preserved specimens. Identification of taxa in some cases, e.g., the sand roaches, was possible to the species level by comparison with authentically identified material. Other taxa were identified using the guidance of Jacques (1947 & 1951), Chu (1949), Hammad (1974), El-Zoheiry and Mohamed (1949), Mandahl-Barth (1974) and Lyneborg (1975).

The sites of these agro-ecosystems were classified according to the system proposed by Long (1979) who estimates a "degree of artificialization" based on the influence of man and his domestic animals in various agricultural practices. This classification is used for graphically representing the results of animal density and biomass along the gradient proposed by the Long system (Figs. 2 and 3). The degrees and characters

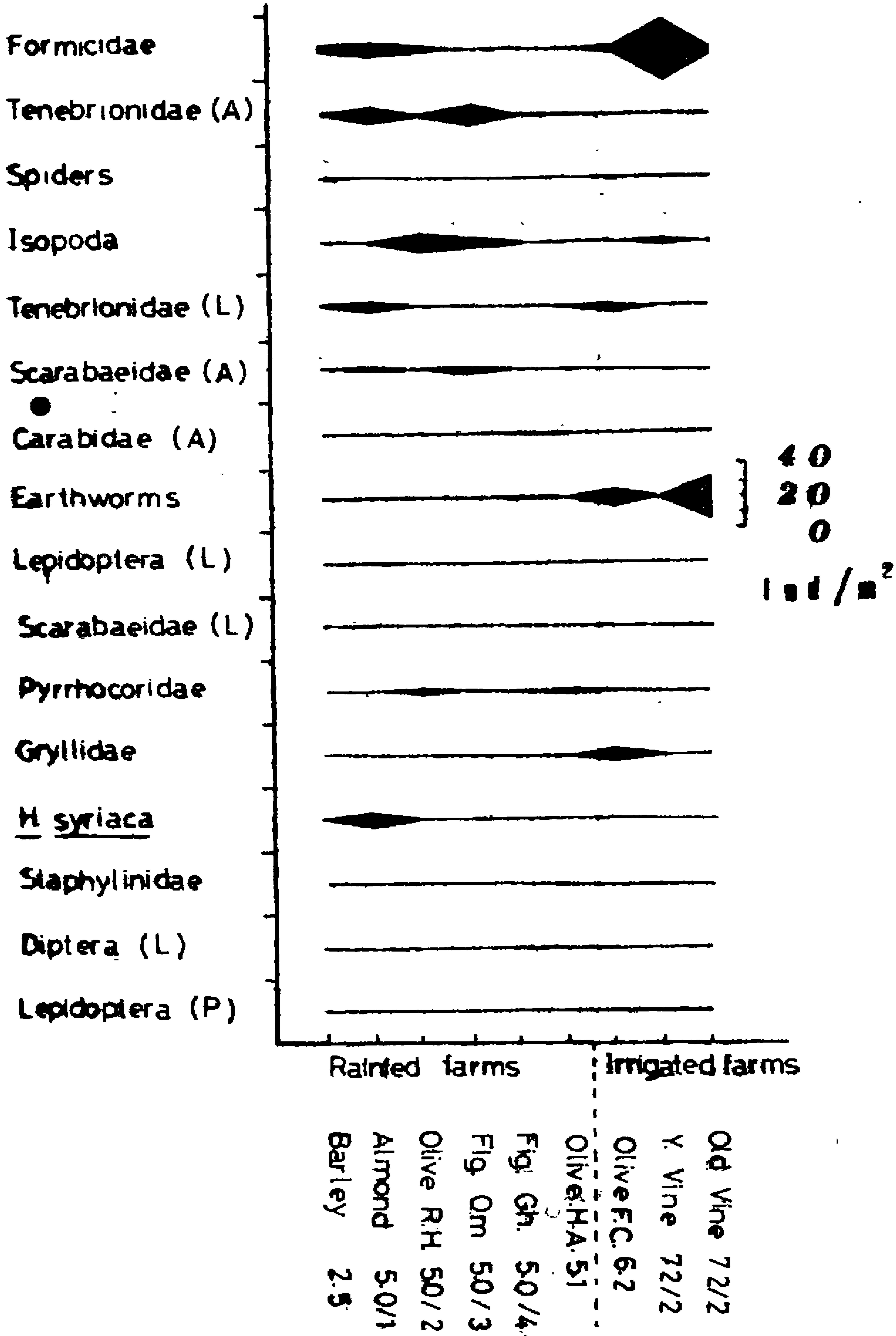

Fig. 2 Poplulation density of major taxa of soil mesofauna in nine agro-ecosystems in the Mariutregion, arranged in the order of their degree of artificialization according to classification of agro-ecosystems in the Mariut region proposed by Long (1979).

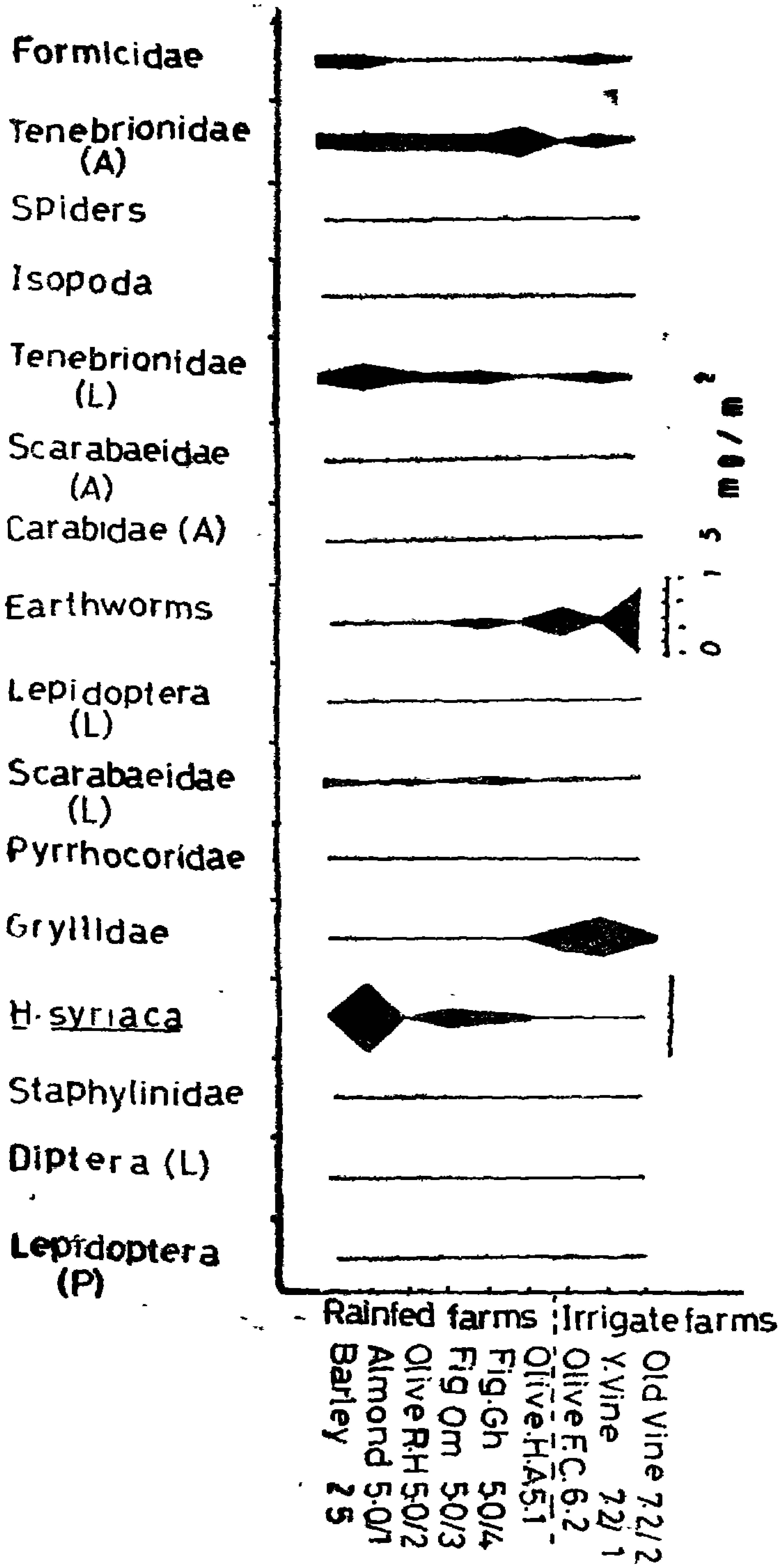

Fig. 3—Biomass of major taxa of soil mesofauna in the same nine agro-ecosystems shown in figs. 1 and 2, also arranged in the order of degree of artificialization.

of each of the selected agro–ecosystems of the present study, are as follows:

—2/4 or 2/5, fallow fields (with perennial or annual herbaceous plants), moderately grazed in rainfed cultivation areas (as barley at Gharbaniat, site no. 4).

—5/0, rainfed arboriculture or viniculture, olive, fig, almond, with little cropping care (as almond at Gharbaniat, site no. 3 ; olive at Rest House, site no. 6 : Fig at Omayed, site no. 1 ; Fig at Gharbaniat site no. 2).

—5/1, same as above, olive, figs, almonds, etc., well cultivated, regular ploughing, regular pruning of the trees, manuring, fertilization (as Haj Ali olive farm, site no. 5).

—6/2, irrgated agriculture, complex rotation (winter cereal or winter legume crop and food or fodder summer crop), (as field crops farm, site no. 9).

—7/2, irrigated orchards, irrigated vine–yards (as irrigated "new" and "old" vine farms at Gharbaniat, sites no. 7 and 8).

The arrangement of taxa of soil fauna in an order of dominance according to abundance (density) in the various agro–ecosystems singly or collectively was made by treating the density data according to the method proposed by Roberts and Hsi (1979), which gives each species a value termed the Index of Species Abundance (ISA).

RESULTS AND DISCUSSION

Table (1) Gives a qualitative impression of the dominant taxa of soil mesofauna (animals larger than 1 mm, i.e., macro–invertebrates) which were extracted from the 6 rain–fed and the 3 irrigated agro–ecosystems selected in the Mariut region and investigated in the period from spring 1977 to autumn 1978. These results are a condensation of the means of 10 quadrats taken for 5 seasons from each agro–ecosystem (450 in all). The Table indicates the dominant taxa appearing in rain–fed agro–ecosystems as a whole, compared with the irrigated, and using the ISA method developed by Roberts and Hsi (1979). According to

Table 1

The top ten taxa of soil mesofauna in rain-fed and irrigated agro-ecosystems in the Mariut coastal desert region, arranged according to their ISA values calculated after the Roberts and Hsi (1979) method.

Rain-fed		Irrigated		Combined	
— Tenebrionidae		— earthworms	1.7	— Formicidae	3.7
adults	2.2	— Formicidae	2.0	— Teneb. (a)	4.2
larvae	7.0	— spiders	4.0	— spiders	6.6
— Formicidae	4.6	— Gryllidae	5.0	— Isopoda	7.3
— Scarabaeidae		— Isopoda	5.7	— Tenebrio-	
adults	7.9	— Carabidae		nidae (1)	7.8
larvae	11.6	adults	6.0	— Scar. (a)	10.7
— spiders	7.9	— Teneb.		— Carab. (a)	10.7
— Isopoda	8.2	adults	8.3	— earth-	
— sand roaches	10.5	larvae	9.5	worms	10.9
(*H. syriaca*)		— Lepidop-		— Lepidop-	
— Carabidae		tera (1)	11.3	tera (1)	12.3
adults	13.1	— Staphyli-		— Scarab. (1)	13.2
— Lepidoptera		nidae	11.5	— Pyrrhoco-	
larvae	13.5	— Pyrrhoco-		ridae	14.6
— Diptera		ridae	12.2	— Gryllidae	14.7
larvae	14.6			— sand roaches	
— Pyrrhoco-				(*H. syriaca*)	14.7
ridae	15.1			— Staphyli-	
				nidae	16.2
				— Diptera	
				larvae	16.4
				— Lepidop-	
				tera (1)	20.0

this method, the top seven dominant taxa in rain-fed agro-ecosystems are : Tenebrionidae, Formicidae, Scarabaeidae, Spiders, Isopoda, Sand roaches (*Heterogamia syriaca*) and Carabidae. In irrigated agro-ecosystems, on the other hand, the top seven taxa are : Earthworms, Formicidae, Spiders, Gryllidae (mostly *Gryllotalpa gryllotalpa*), Isopoda, Carabidae, and Tenebrionidae. The change in the order of dominance of taxa is evident in the case of Tenebrionidae, for example, while the appearance and dominance of earthworms, Gryllidae and Staphylinidae in irrigated agro-ecosystems is notable. However, there are certain taxa which remaind dominant in both types of agro-ecosystems, such as Formicidae, Spiders and Carabidea, indicating that the irrigated agro-ecosystems still retain the characteristic fauna of the surrounding original habitats.

Table (2) indicates the mean annual population density of the most important taxa in each of the 9 selected agro-ecosystems. Table (3) shows the mean annual biomass of these taxa. The mean annual population density (PD) in rain-fed agro-ecosystems is 24.2/m2, compared with 46.8/m2 in irrigated systems, showing a doubling in density. The mean annual biomass in rain-fed systems is 1330.6 mgm/m2 (alcohol or formalin-preserved), compared with 1463.6 mgm/m2 in irrigated systems, showing only a 10% increase, reflecting the decrease in dominance of such heavy-bodied taxa as Tenebrionidae and Scarabaidae.

It is clear from the present results and from field observations that earthworms invaded these desert agro-ecosystems largely when these were irrigated. Earthworms actually appeared in these sites in periods of irrigation and disappeared in periods of non-irrigation. The earthworms that did appear were nearly all juvenile lumbricids and few of the worms were in the adult stage. *Allolobophora caliginosa* appeared in sites nos. 2, 3, 5, 7, and 8. *Eisenia rosea* appeared in site no. 9, wherein its appearance was in all 5 seasons of investigation. Therefore, Ghabbour and Shakir (1980 b) suggested that *E. rosea* could be used as an indicator of the complete transformation of irrigated agro-ecosystems in Mariut to conditions approaching those prevailing in the nearby fields of the Nile Delta, which are the source of the invading soil fauna in irrigation water or in manure fertilizers.

Table 2

Average annual population density of soil mesofauna (per m2) in nine farms in the Ma ut region (see Fig. 1) for serial number of farms.

Taxa of soil measofauna	Rain-fed (Rf) 1	2	3	4	5	6	Irrigated (Ir) 7	8	9	mean Rf	mean Ir
earthworms..	0.0	2.4	0.2	0.0	0.6	0.0	28.6	2.0	13.7	0.5	14.8
Isopoda	5.7	0.4	1.5	0.3	0.0	11.7	0.7	3.4	0.6	3.3	1.6
spiders	0.3	0.2	0.6	0.5	1.0	1.1	1.9	1.9	3.4	1.2	2.[illegible]
Gryllidae	0.0	0.0	0.0	0.1	0.0	0.1	0.4	1.4	9.8	0.0	3.9
sand roaches (*H. syriaca*)	1.5	1.1	9.8	0.4	0.0	0.0	0.0	0.0	0.0	2.1	0.0
Pyrrhocoridae	0.0	0.1	0.0	0.0	3.3	3.9	1.0	0.1	0.0	1.2	0.3
Lepidoptera (larvae & pupae)	0.2	0.2	0.2	0.1	0.0	0.3	0.9	0.5	0.4	0.3	0.6
Diptera (larvae)	1.1	0.1	1.4	0.1	0.0	0.0	0.0	0.0	0.2	0.4	0.1
Formicidae	0.2	0.6	9.4	3.2	1.2	3.9	7.7	40.1	6.4	3.1	18.8
Tenebrionidae (larvae & adults)	16.9	4.0	17.6	3.3	1.9	2.2	0.2	0.9	5.3	7.6	2.2
Scarabaeidae (larvae & adults)	6.4	1.0	3.8	1.1	0.1	0.4	0.2	0.1	0.1	2.1	0.3
Carabidae (larvae & adults)	0.1	0.3	0.6	0.1	0.3	0.2	1.0	0.6	0.8	0.2	0.8
Staphylinidae	0.0	0.0	0.0	0.0	0.4	0.7	0.4	0.0	0.9	0.2	0.4
Others	1.6	1.3	4.5	0.3	5.5	1.3	0.6	0.6	1.5	2.0	0.6
Total	34.0	11.7	49.6	9.5	14.3	26.3	45.6	51.6	43.3	24.2	46.8

Table 3

Average annual biomass of 12 top taxa of soil mesofauna in nine agro–ecosystems in the Mariut coastal desert region, in mgm/m2.

Taxon	Rain–fed	Irrigated
earthworms	83.4	602.7
Isopoda	21.5	20.3
spiders	6.9	27.5
Orthoptera	0.4	453.7
Dictyoptera	337.4	5.2
Hemiptera	14.1	5.0
Homoptera (Cicadidae)	117.7	0.0
Neuroptera	13.8	0.0
Lepidoptera	23.7	77.5
Diptera	7.8	4.9
Hymenoptera	72.0	57.3
Coleoptera	671.7	203.8

Gryllidae which invaded the irrigated agro–systems of the Mariut region were mostly the notorious pest *Gryllotalpa gryllotalpa* at an average PD of 3.9/m2 and an average biomass of 451.5 mgm/m2. Coleoptera appeared in high PD and biomass in rain–fed agro–ecosystems than in irrigated ones (10.8/m2 against 3.8/m2 in density and 671.7 mgm/m2 against 203.8 mgm/m2 in biomass). Tenebrionidae, as adults and larvae, are the main constituent of this Order, making up 71 % of its numbers in rain–fed agro–ecosystems and 57% in irrigated ones, and 81% of biomass in the former against 73% in the latter. The status of Tenebrionidae can therefore be used as an indicator of the transformation of agro–ecosystems into more artificialization. Isopoda are an important component of the fauna in both types of agro–ecosystems, appearing at an average PD of 3.3/m2 in rain–fed, and at 1.6/m2 in irrigated systems, and a biomass of 21.5 mgm/m2 in the former and 20.4 mgm/m2 in the latter, indicating heavier–bodied species inhabiting irrigated agro–ecosystems. Other taxa of soil mesofauna fluctuated irregularly in density and biomass between rain-fed and irrigated agro-ecosystems according to the seasonality of appearance of the taxon in question or the stage of its life-cycle.

When comparing soil mesofauna in the various crops and orchard farms, it appears that density under rainfed barley is less than under rain-fed orchards in general. The average annual density is only 9.5/m2 compared with 11.7—49.6/m2 under rain-fed orchards. In fact, it is the lowest density of all sites. Similarly, irrigated field crops have a slightly lower average annual density than irrigated orchards, 43.3/m2 in the former against 45.6—51.6/m2 in the latter. The same holds for biomass, which, on an annual average, is 739.3 mgm/m2 under barley and 805.9—2721.7 mgm/m2 under rain-fed orchards. The average annual biomass of soil mesofauna in irrigated field crops, on the other hand, is also slightly lower than in irrigated orchards, reaching 1437.0 mgm/m2 in the former, against 1465.9—1488.3 mgm/m2 in the latter.

Fig. 2 shows the distribution of PD of soil mesofauna along the gradiant of degree of artificialization as proposed by Long (1979). The sixteen taxa common to both rain-fed and irrigated agro-ecosystems are shown. The term taxon is here used in a broad sense encompassing the ecological role of a certain stage in the life-cycle of the organism if its niche is different from that of other stages in the life-cycle. It is clear from Figs. 2 and 3 that some taxa increase with irrigation, some decrease, while still some others remain at their original levels. Rainfed systems are charactarized, as the Figs. show, by high densities of Formicidae, Tenebrionidae, Isopoda, Scarabaeidae and sand roaches (*H. syriaca*), comfirming the results reached at by the use of the ISA method of Roberts and Hsi (1979). Irrigated agroecosystems are characterized, on the other hand, by high densities of Formicidae, earthworms and Gryllidae, again confirming the findings reached at by the ISA method. However, increase or decrease in density of these taxa does not strictly follow the gradient of degree of artificialization proposed in Long's classification. When we come to biomass (Fig. 3), we find that Formicidae show higher biomass at both ends of the gradient and low biomass in the middle. Adult Tenebrionidae appear to show an increasing trend from the lower end (barley) to the higher end of rain-fed systems (i.e., profit from increased artificialization as long as there is no irrigation). They fall to almost zero level, and then have a moderate biomass in the middle of the scale of irrigated systems. Larval Tenebrionidae show an irregular pattern, as well as earthworms, Pyrrhocoridae, Lepidoptera, Carabidae, Isopoda, and Scarabaeidae. Gryllidae do not follow the gradient in irrigated systems, although they are present only in these systems. On the other hand, sand roaches do not follow the gradient in rain-fed systems, to which they are characteristic. It seems that Gryllidae replace sand roaches as the successful burrowers when irrigation is introduced.

Thus it appears from Figs. 2 and 3 that the increase or decrease of PD or biomass of soil mesofauna does not follow, in most cases, the linear gradient of degree of artificialization as proposed by Long (1979). In fact, the various taxa of soil mesofauna as revealed in this study can be used to construct a more realistic system of classification of agro-ecosystems in which they are not conceived as arranged on a ladder with the least artificialized at the bottom and the most atificialized at the top, but rather positioned on branches of a tree which have several levels of artificialization as well as several forms and several ways in which this artificialization is acquired. In other words, a dendritic system is more realistic than a ladder-type system of classifying agro-ecosystems. As far as the Mariut region agro-ecosystems are concerned, this dendritic system will have at its base the "natural" vegetation in the Mariut frontal plain and its associated soil mesofauna, as studied by Ghabbour and Shakir (1980 a), and the littoral sand dune vegetation and its associated soil mesofauna as studied by Ghabbour, Mikhail and Rizk (1977), both at the Gharbaniat locality. Further branching of the system may be into : rain-fed and irrigated, then each into field crops and orchards, then each further may branch into : littoral (coastal) or inland. There is in fact evidence (Ghabbour and Shakir, in preparation) that the soil mesofauna of rain-fed and irrigated agro-ecosystems in the inland depression are more similar to each other than either of them to the coastal rain-fed agro-ecosystems. There is need to establish more data in order to be able to elaborate such a dendritic system of classification.

It is evident that no two agro-ecosystems are similar in the order of the most important taxa (dominance in PD or in biomass). If, on the other hand, distribution of the taxa in the various agro-ecosystems, is considered, we find that Formicidae have the highest frequency in the list of the five most abundant taxa, being thus represented in 8 agro-ecosystems, followed by Tenebrionidae in 7, spiders in 6, Isopoda and earthworms in 5 each, Scarabaeidae in 4, sand roaches and Pyrrhocoridae in 3 each, Gryllidae in 2, and finally Carabidae and Diptera larvae in one each. The order of abundance of these dominant taxa in the nine agro-ecosystems is as follows :

Taxon	Agro-ecosystems (numbered as under Material and Methods) in decreasing order							
Formicidae	8	7	3	9	6	4	5	2
Tenebrionidae	3	1	9	2	4	6	5	
spiders	9	8	7	6	5	3		
Isopoda	6	1	8	3	7			
earthworms	7	9	2	8	5			
Scarabaeidae	1	3	4	2				
sand roaches	3	1	2					
Pyrrhocoridae	6	3	7					
Gryllidae	9	8						
Carabidae	7	9						
Diptera larvae	3	1						

Again, it is clear that a linear classification of agro-cosystems, if based on findings on population density and biomass of soil mesofauna, is not possible, and that a dendritic system of classification is more realistic and appropriate. Further data on similarity and diversity needed to support this classification will be presented elsewhere (Ghabbour and Shakir, in preparation).

Prof. G. Long (pers. comm.) confirmed that the linear classification, based solely onvegetational datasho , uld be appropriate only for vegetational comparisons, and that it is not meant for comparing other components of the ecosystem.

Quelques Traits des Taxons Importants de la Mésofaune du Sol dans un Désert Côtier Afro–Méditerranéen. I.–Considérations Générales sur la Mésofaune du Sol dans les Agro– Ecosystèmes.

par S.I. Ghabbour et Safwat H. Shakir

Dept. de Ressources Naturelles,

Inst. de Recherches et d'Etudes Africaines.

Université du Caire, Guizé, (Le Caire), Egypte

Résumé

1— Neuf agro–écosystémes de la region du désert côtier de Mariout ont été choisi pour étudier les effets de l'agriculture à sec (utilisant la pluie) et l'agriculture irriguée (utilisant l'eau du Nil), sur les populations de la faune du sol, en particulier ceux de la mésofaune (plus grande qu'un mm). Ces sites sont classifiés ainsi :

A— Agro–écosystémes utilisant la pluie :

i) sur la zone côtiére :

1— figuier sur la côte à Omayed
2— figuier sur la côte à Gharbaniat
3— amandier sur la côte à Gharbaniat
4— Orge sur la côte à Gharbaniat

ii) sur la zone intérieure :

5— olivier de "Haj Ali" à Bourg El–Arab
6— olivier du "Rest House" à Bourg El–Arab

B— Agro–écosystémes irrigués ü l'eau du Nil :

7— "vielle" vigne à Gharbaniat (établie an 1971)
8— "nouvelle" vigne à Gharbaniat (établie en 1974)
9— culture à assolement à Bourg El–Arab (maize et tréfle).

2— L'échantillonnage a commencé au printemps de 1977 est a duré jusqu à l'automne de 1978. Dix prélévements ont été pris de chaque site (chaqu'un 50 × 50 × 60 cm de dimension). Les animaux extraits étaient passés à travers un tamis d'un mm dans le cas des deux premiers écosystémes, ou triés à la main dans les autres écosystémes. Les animaux étaient assortis à l'aide d'un microscope binoculaire au labo, et presservés dans l'alcool 70% ou le formol 4—6%.

3— La densité de la mésofaune du sol dans les agro-écosystémes irrigués est presque le double que celle dans les agro-écosyestémes à sec, d'une moyenne de 46.8 contre 24,2/m2, tandis que la biomasse annuelle moyenne sous irrigation n'est que 10% plus élevée que celle des systémes à sec, 1464 contre 1331 mgm/m2.

La densité sous l'orge (une culture annuelle à sec) est moins élevée que celles sous l'arboriculture â sec (9,4 contre 11,7—49,6/m2). De même la densité sous l'assolement de maize et tréfle est moins élevée que celles sous l'arboriculture irriguée, 43,3 contr e 45,6—51,6/m2.

4— Les taxons dominants dans l'ensemble des neuf agro-écosystémes sont : Formicidae, Tenebrionidae, et araignées. Les taxons dominants dans l'ensemble des agro-écosystémes â sec sont : Tenebrionidae, Formicidae, et Scarabaeidae, tandis que dans les agro-écosystémes irrigués ils sont : les vers de terre, Formicidae, et araignées.

5— Un essai de ranger la densité et la biomasse de la mésofaune du sol sur une échelle des agro-écosystémes étalés d'aprés leur "degré d'artificialisation" (conçue par LONG) a été tenté. Il est constaté que cette tentation n'est pas possible car les données sont en désaccord. Une classification dendritique des agro-écosystémes serait plus réalistique et plus appropriée., qu'une classification linéaire.

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بعض معالم اقسام حيوانات التربة المتوسطة الحجم فى صحراء ساحلية افرومتوسطية

١ ـ اعتبارات عامة عن حيوانات التربة متوسطة الحجم فى النظم البيئية الزراعية

اعـــــداد

د. سمير ابراهيم غبـور و صفوت هلال شـاكر

قسم الموارد الطبيعية ، معهد البحوث والدراسات الافريقية جامعة القاهرة

اختيرت ٩ مواقع تمثل نظما بيئية زراعية تتراوح بين الزراعة المطرية أو المروية فى الصحراء الساحلية بمريوط غرب الاسكندرية ومن بين هذه المواقع ستة للزراعة المطرية منها أربعة على الساحل هى التين الساحلى بالعميد والتين الساحلى بالغربانيات واللوز الساحلى بالغربانيات والشعير الساحلى بالغربانيات ومنها اثنتان بالداخل هما زيتون يملكها أحد المزارعين المستوطنين (مزرعة الحاج على) والاخرى بقرب استراحة كلية العلوم وكلتا المزرعتين ببرج العرب . اما الزراعات المروية بماء النيل فهى عنب «قديم» وعنب «حديث» بالغربانيات ومحاصيل حولية ببرج العرب. وقد أجريت دراسة تهدف الى التعرف على أثر الغطاء النباتى وأسلوب الرى على عشائر حيوانات التربة متوسطة الحجم تمهيدا للتعرف على ما ينتابها من تغيرات نتيجة المعاملات الزراعية والتنبؤ بما يمكن لهذه النظم الزراعية أن يحدث من تحسن أو تدهور باتخاذ هذه العشائر بمثابة مؤشرات احيائية لحالة البيئـــة .

وقد تراوحت الكثافة العشائرية بين ٢٤/م٢ فى الزراعـات المطـرية و٤٧/م٢ فى الزراعات المروية فى المتوسـط وتراوح الوزن الخى بين ١٣٣٠ مجم/م٢ فى الزراعـات المطـرية و١٤٦٠ مجم/م٢ فى الزراعـات المروية فى المتوسط وكانت الكثافة مع الشعير أقل مما كانت مع الاشجار المنزرعة على المطر وبالمثل كانت الكثافة مع المحاصيل الحولية المروية اقل مما كانت مع الاشجار المنزرعة بالرى .

وكانت العشائر السائدة فى المواقع التسعة بصفة عامة هى النمل والظـلاميات والعناكب وكانت العشائر السائدة فى الزراعـات المطرية هى الظلاميات والنمل والجعليات بينما كانت فى الزراعات المروية هى ديدان الارض والنمل والعناكب .

وليس من الممكن فى الوضع الراهن تنظيم هذه المواقع على خط واحد متدرج حسب درجة التصنيع بل الأولى ان تصف فى ترتيب شجرى متفرع وهو أقرب الى الواقع وأكثر ملاءمة لأوضاع عشائر حيوانات التربـــة المتوسطة الحجم .