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SYNOPSIS OF THE PHYTOSOCIOLOGICAL UNITS OF PALESTINE

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(With Plates V—IX, 13 transects and 1 map)

This paper is a summary of phytosociological studies on the Palestine vegetation by the author. The phytosociological investigation of Palestine by the late Dr. A. Eig was begun in 1932 and continued until shortly before his death in 1938. During this time a great number of phytosociological records have been collected by the author and his collaborators in Palestine, as well as in other countries of the Middle East. This work has not been summed up for the press and, except for the psammophytic plant communities of the Coastal Plain and the Quercetum ithaburensis on which studies were completed and published (Eig, 1939, 1933), the whole bulk of the collected material has remained in the form of field notebooks. However, the delimitation of the plant-sociological units, their classification and naming, as far as desert and steppe vegetation are concerned, were summarized by the author before his death, in a synoptic list, with short accompanying remarks. As to the non-desert units, they have been regarded by the author as tentative and preliminary. The editors are fully aware that the author would have made considerable alterations in the delimitation and naming of some of the Mediterranean plant communities before publishing them, as he did on other occasions. The editors, however, considered it best not to deviate from the original text.

As the vegetation units have not been recorded into analytical tables by the author, the editors have considered it advisable to represent each association by a single typical sample-record, taken from a habitat more or less characteristic of each plant association, reflecting its main floristic features. The geographical distribution of each association, as reflected in the field notes, is recorded too. Only a few associations — insufficiently studied by the author and later given up as units by him — have been excluded.

The Editors

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INTRODUCTION [1]

In 1931 I published in " Les éléments et les groupes phytogéographiques auxiliaires dans la flore palestinienne" a phytogeographical map of Palestine. In that map the most interesting fact has been emphasized that Palestine is a meeting point of three phytogeographical regions, Mediterranean, Irano-Turanian and Saharo-Sindian.

I. MEDITERRANEAN TERRITORIES

The plant associations of the Mediterranean territories of Palestine have been studied by us comparatively less than the Irano-Turanian and the Saharo-Sindian. The most interesting fact revealed by our studies of the Mediterranean territories is the small size of the Mediterranean territory of Transjordania.

The Mediterranean territories of Palestine were once dominated by forest associations as is the rule in the Mediterranean region. These climax associations of Palestine are the associations of *Pinus halepensis—Hypericum serpyllifolium,* a type of *Ceratonia siliqua—Pistacia Lentiscus, Quercetum ithaburensis, Quercus calliprinos—Crataegus Azarolus* and probably also a type of *Quercetum infectoriae.*

The principal climaxes are the first three. To one of them (*Quercetum ithaburensis*) we have devoted a separate paper (EIG,

[1] This introduction is a part of the author's paper published in this Journal (Vol. I, 1938: 4-13) entitled: "On the phytogeographical subdivision of Palestine".

1933). Papers are in preparation on the vestiges of the forest of *Pinus halepensis—Hypericum serpyllifolium* and of *Ceratonia siliqua—Pistacia Lentiscus*. A few remarks on these forests are to be mentioned here: there are only few remnants of forests of *Pinus halepensis —Hypericum serpyllifolium* in Western Palestine; the best ones are in the southwestern part of Mount Carmel. In Transjordania some beautiful forests of *Pinus halepensis—Hypericum serpyllifolium* are still to be seen. Remnants of *Quercetum ithaburensis* are more numerous in Western Palestine and are encountered also in Transjordania. Remnants of type of *Ceratonia siliqua—Pistacia Lentiscus* forests are encountered along the sea-coast and on the eastern slopes of Samaria mountains.

Quercetum infectoriae, a type of *Quercion infectoriae* not yet especially studied, was very scarce in Palestine and its vestiges are encountered chiefly in Upper Galilee, *Quercus calliprinos—Crataegus Azarolus* forests we have seen in Syria, on the Lebanon, but also in Jebel Druz, on the Palestinian border. It is very probable that this forest association was once represented also in Palestine, and that some of the Palestinian types of *Quercus calliprinos—Pistacia palaestina* Maqui are not degradation stages of *Quercetum ithaburensis* or of *Pinus halepensis— Hypericum serpyllifolium* forests but rather of the high forests of *Quercus calliprinos—Crataegus Azarolus*.

Maqui, the first degradation stage of climaxes, is still well preserved in many parts of Western Palestine and in some parts of Transjordania. The principal Maqui association is that of *Quercus calliprinos—Pistacia palaestina*, represented by several types.

The principal associations of Palestinian Garigue (further degradation stage of the climax associations) are the *Cistus villosus—Cistus salvifolius* association and *Salvietum trilobae* (probably only a variation of the former). In most cases Palestinian Garigue is a clearly transitional formation between Maqui and Batha. Sharply delimited Garigue associations are rather exceptional.

On the contrary, the Batha formation (Eig, 1927), principally the one before the last stage of degradation of climax associations, is widely represented, and its associations are generally well delimited. The principal association is *Poterietum spinosi* in several variations. It is the most widely distributed Mediterranean association of Palestine. *Thymetum capitati* and *Fumanetum thymifoliae* are also rather common on more rocky ground. The most interesting rock associations are *Varthemietum iphionoides* and *Stachydetum palaestinae* (the latter may be only a subassociation of the former).

Of the associations of the light soil of the Coastal Plain I wish to mention especially that of *Eragrostis bipinnata—Centaurea procurrens* and *Helianthemetum elliptici*. This last, notwithstanding the purely Mediterranean climatic conditions, is floristically hardly, if at all a Mediterranean association. To this and to other associations of this belt I shall devote a special article in one of the next numbers of this Journal.

II. IRANO-TURANIAN TERRITORIES

The Irano-Turanian territories of Palestine are three in number:

(1) The Irano-Turanian enclave of the Judean Desert. This stretches in a rather narrow strip from the Sea of Kinnereth (Sea of Galilee) up to the Negeb along the eastern slopes of the Samarian and Judean Mountains. The most important associations are those of *Retamo-Phlomion brachyodontis* and *Noeion mucronatae* alliances. Several subassociations of *Artemisietum Herbae albae* (*deserti-judaicum*) are encountered but are rather limited in extent. Compressed between the Mediterranean territory of Western Palestine and the Saharo-Sindian territory of the Lower Jordan Valley and its adjacent mountain slopes, the Irano-Turanian associations of this enclave have but little space to develop in typical forms and in typical floristical composition. Many Mediterranean and Saharo-Sindian plants penetrate into these Irano-Turanian associations.

(2) The Negeb (the near Negeb). Associations of *Artemision Herbae albae* dominate here. A great part of this Irano-Turanian territory is under cultivation (extensive cultivation of barley) and its natural vegetation is uncertain.

(3) The Irano-Turanian part of Transjordania. The major part of Transjordania E of the Hedjaz railway belongs to the Syrian Desert; we shall consider it on another occasion when dealing with the vegetation of the Syrian Desert. W of the Hedjaz railway, a great part of Transjordania belongs to the Irano-Turanian territory. From our investigations so far three principal subdivisions can be designated in this territory. In the N we have encountered vestiges of the extremely interesting Irano-Turanian open forest of *Pistacia atlantica*. The middle and largest subdivision is dominated by one or two types of *Artemision Herbae albae* (*Artemisia Herba alba—Rheum Ribes* is the principle). Associations of *Haloxylion articulatae* are also rather common. The last subdivision is the high plateau W and SW of Ma'an. This plateau is distinguished by some vestiges of a type of an open forest where *Juniperus phoenicea* grows together with *Artemisia Herba alba* etc. A not less interesting association is that of *Artemisia Herba alba—Astragalus adpressiusculus* where groups of *Crataegus Azarolus* are meet with here and there. It is on this plateau also that we discovered a series of plants of importance for the elucidation of the history of transjordanian vegetation (*Hedera Helix, Prunus prostrata, Astragalus adpressiusculus* etc.).

III. SAHARO-SINDIAN TERRITORIES

There are three of four Saharo-Sindian territories of Palestine:

(1) Lower Jordan Valley and the adjacent lower slopes of the mountains. The banks of the Jordan river are clothed chiefly by a riparian forest of *Populion euphraticae*, which has been unsufficiently studied. In the plains of the Jordan Valley the associations of *Suaedion palaestinae* (especially important are different subasso-

ciations of *Suaedetum palaestinae*) and *Salsolion tetrandrae* predominates. The mountains surrounding the Jordan Valley are dominated by different types of *Suaedetum asphalticae,* associations of *Gymnocarpion fruticosi* and *Chenoleion arabicae.*

(2) The Valley of 'Araba. The vegetation of 'Araba is almost unknown. Our 2 or 3 short trips to this valley have revealed that the Sudano-Decanian element which is encountered here and there in the Lower Jordan Valley, occasionally true enclaves (EIG, 1931) and which belongs to the Sudano-Decanian *Acacietalia tortilis* (its alliance *Acacion palaestinae*), is here still more accentuated. A quasi climatical association of *Acacion palaestinae* with *A. tortilis* as the dominant tree, is encountered here and there. As in a true Saharo-Sindian territory the climatic associatons are here few in number and poorly developed.

(3) The far Negeb. In its northern part the climatic association of *Zygophylletum dumosi,* is the most prominent. *Gymnocarpetum fruticosi* is also encountered but rarely. In the southern part climatic associations are poorly developed or almost absent. Edaphical associations are bound especially to the Wadis.

(4) The Saharo-Sindian territory of Transjordania. *Zygophylletum dumosi* is extremely rare. *Haloxyletum salicornicum* is found only in this part. Associations of *Chenoleion arabicae* and *Salsolion tetrandrae* are among the most common.

The spacial succession of the different associations on crossing from one territory to another is of a surprising regularity, thus permitting a phytosociological criterion in the demarcation of the different phytogeographical territories.

The border line of the Mediterranean and Irano-Turanian territories in Palestine runs principally along *Poterietum spinosi* (its variation "*orientale*") on the one hand and the associations of *Artemision Herbae albae* and *Retamo-Phlomion brachyodontis* on the other. Some transitional associations of lesser importance occupy comparatively small transitional areas, characterized by transitional ecological conditions, e.g. *Salvietum graveolentis, Echinopetum Blancheanae* etc. However, by their floristical composition they are Irano-Turanian rather than Mediterranean associations.

The border line of the Irano-Turanian and Saharo-Sindian territories is occupied especially by the associations of *Noeion mucronatae, Haloxylion articulatae* and *Artemision Herbae albae* on the one hand, by the associations of *Suaedion asphalticae, Chenoleion arabicae, Gymnocarpion fruticosi* and even by *Zygophylletum dumosi,* the most characteristic Saharo-Sindian association of Palestine, on the other. Different types of *Salsoletum villosae,* of *Anabasis articulata—Zilla myagroides,* of *Reaumurietum palaestinae* and of *Atriplicetum palaestinae* are geographically, ecologically and floristically transitional Irano-Turanian—Saharo-Sindian associations of Palestine.

CONSPECTUS OF THE PLANT ASSOCIATIONS DEALT WITH

A. Mediterranean associations

The Mediterranean vegetation is to be subdivided into three main formations[1]; Forest and Maqui, Garigue, and Batha (dwarf-shrub formation).

(i) Forest and Maqui plant associations:
- (1) Association of *Pinus halepensis-Hypericum serpyllifolium*
- (2) *Quercetum ithaburensis*
- (3) Association of *Quercus calliprinos-Pistacia palaestina*
- (4) Association of *Ceratonia Siliqua-Pistacia Lentiscus*

(ii) Garigue associations:
- (5) Associations of *Cistus villosus-Cistus salvifolius*
- (6) *Calycotometum villosae*

(iii) Batha associations:
- (7) *Poterietum spinosi mediterraneum*
- (8) *Poterietum spinosi orientale*
- (9) *Thymetum capitati*
- (10) Association of *Thymus capitatus-Andropogon hirtus*
- (11) *Salvietum graveolentis*
- (12) Association of *Poterium spinosum-Thymelaea hirsuta*
- (13) *Echinopetum Blancheani.*
- (14) *Ononidetum Natricis*

B. Irano-Turanian associations

The Irano-Turanian vegetation comprises shrub and dwarf-shrub associations. The following alliances have ben distinguished:

(i) *Artemision Herbae albae*
- (15) *Artemisietum Herbae albae*
- (16) Association of *Artemisia Herba alba-Asphodelus microcarpus*

(ii) *Haloxylonion articulati*:
- (17) Association of *Haloxylon articulatum-Salsola villosa*
- (18) Association of *Anabasis Haussknechtii-Poa sinaica*
- (19) Association of *Anabasis Haussknechtii-Plantago Coronopus*

(iii) *Noëion mucronatae*:
- (20) Association of *Noëa mucronata-Ononis Natrix*
- (21) *Noëetum mucronatae*

(iv) *Retamo-Phlomion brachyodontis*:
- (22) *Phlomidetum brachyodontis*
- (23) Association of *Phlomis brachyodon-Blepharis edulis*
- (24) *Retama Duriaei-Blepharis edulis*
- (25) *Retama Duriaei-Rhus oxyacanthoides*

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[1] The lithophytic, psammophytic, hydrophytic and halophytic associations of the Mediterranean territory are dealt with under particular headings together with the associations of similar habitats of other phytogeographical territories.

C. Saharo-Sindian associations

The following alliances and plant associations have been distinguished in the Saharo-Sindian territory of Palestine:

(i) *Salsolion villosae*:
- (26) *Salsoletum villosae*
- (27) Association of *Salsola villosa-Gymnocarpus fruticosus*
- (28) Association of *Salsola villosa-Stipa tortilis*
- (29) Association of *Anabasis articulata-Notoceras bicorne*

(ii) *Gymnocarpion fruticosi*:
- (30) *Gymnocarpetum fruticosi*
- (31) Association of *Gymnocarpus fruticosus-Zilla spinosa*

(iii) *Zygophyllion dumosi*:
- (32) *Zygophylletum dumosi*

(iv) *Chenoleion arabicae*:
- (33) Association of *Erodium glaucophyllum-Herniaria hemistemon*
- (34) *Chenoleetum arabicae*
- (35) Association of *Chenolea arabica-Salsola villosa*

(v) *Anabasidion articulati*:
- (36) Association of *Anabasis articulata-Zilla spinosa*

(vi) *Suaedion asphalticae*:
- (37) *Suaedetum asphalticae*

(vii) Associations of uncertain phytosociological relationship:
- (38) *Altriplicetum palestinae*
- (39) *Reaumurietum palaestinae*
- (40) *Halogetonetum alopecuroidis*

D. Sudano-Deccanian associations

The order *Acacietalia tortilidis* comprises among others the alliance *Acacion tortilidis palaestinae* with the following associations:
- (41) *Acacietum tortilidis palaestinum*
- (42) Association of *Zizyphus spina-Christi-Moringa aptera*
- (43) Association of *Zizyphus spina-Christi-Balanites aegyptiaca*

E. Litho- and chasmophytic associations

- (44) *Varthemietum iphionoidis*
- (45) *Telmissetum microcarpae*
- (46) *Crepidetum hierosolymitanae*
- (47) Association of *Cheilanthes fragrans-Ceterach officinarum*
- (48) *Origanetum Dayi*

F. Psammophytic associations

The following alliances (i), (ii), (iii) have been distinguished in the Coastal Plain of Palestine and (iv), (v) on sand dunes and sandy soils of the deserts.

(i) *Lotion creticae*:
- (49) Association of *Sporobolus arenarius-Lotus creticus*
- (50) Association of *Helianthemum ellipticum-Lotus creticus*
- (51) Association of *Ipomoea littoralis-Salsola Kali*

(ii) *Artemision monospermae*:
(52) Association of *Ammophila arundinacea-Cyperus conglomeratus*
(53) Association of *Lithospermum callosum-Scrophularia hypericifolia*
(54) Association of *Artemisia monosperma-Cyperus mucronatus*
(55) Association of *Atractylis flava-Crucianella maritima*
(iii) *Eragrostion bipinnatae*:
(56) *Helianthemetum elliptici*
(57) Association of *Ononis stenophylla-Convolvulus secundus*
(58) Association of *Eragrostis bipinnata-Centaurea procurrens*
(59) *Ormenidetum mixtae*
(iv) *Retamion Roetami arenarium*:
(60) Association of *Artemisia monosperma-Retama Roetam*
(61) Association of *Retama Roetam-Anabasis articulata*
(62) *Retametum Roetami*
(v) Association of uncertain phytosociological relationships:
(63) *Haloxylonetum salicornici*

G. Hydrophytic associations

(i) *Populion euphraticae*:
(64) *Populetum euphraticae*
(65) *Tamaricetum jordanis*
(66) Association of *Prosopis farcata-Glycyrrhiza glabra*
(ii) Association of:
(67) *Platanetum orientalis*
(68) Association of *Cyperus Papyrus-Polygonum acuminatum*
(69) Association of *Phragmites communis-Typha angustata*
(70) Association of *Inula viscosa-Juncus acutus*
(71) *Viticetum Agni-Casti*
(72) *Equisetetum ramosissimi*
(73) Association of *Juncus maritimus-Schoenus nigricans*
(74) Association of *Crypsis minuartioides-Heliotropium supinum*

H. Halophytic associations

(i) *Suaedion palaestinae*:
(75) *Suaedetum palaestinae*
(76) Association of *Suaeda palaestina-Suaeda fruticosa*
(77) Association of *Nitraria retusa-Suaeda palaestina*
(78) Association of *Atriplex Halimus-Suaeda fruticosa*
(79) Association of *Atriplex Halimus-Salsola villosa*
(ii) *Salsolion tetrandrae*:
(80) *Salsoletum tetrandrae*
(81) Association of *Salsola tetrandra-Halogeton alopecuroides*
(iii) Associations of other alliances:
(82) *Nitrarietum retusae*
(83) *Altriplicetum Halimi*
(84) *Arthrocnemetum glauci*
(85) *Phragmitetum communis (salinum)*.

I. Segetal associations

(86) Association of *Carthamus tenuis-Ononis leiosperma*
(87) *Prosopidetum farcatae*
(88) *Malvetum aegyptiae*
(89) *Achilleetum Santolinae*

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A. Mediterranean associations

(i) Forest and Maqui associations:

(1) Association of *Pinus halepensis-Hypericum serpyllifolium* (Eig 1938) Pl. V A

Sample record: Mt. Carmel, env. of Wadi Shallala, descent of Wadi; exposure NW; slope 40-50°; Senonian(?) rocks, patches of fine soil between rocks; are 100 m²; coverage 100%.

Pinus halepensis	3.3	*Asparagus aphyllus*	1.2
Quercus calliprinos	3.3	*Rubia Olivieri*	1.2
Crataegus Azarolus	1.2	*Eryngium falcatum*	1.1
Phillyrea media	1.2	*Lotus judaicus*	1.1
Pistacia palaestina	1.2	*Atractylis comosa*	+
Arbutus Andrachne	1.2	*Carex distans*	+
Laurus nobilis	1.2	*Cephalanthera longifolia*	+
Spartium junceum	1.2	*Crepis hierosolymitana*	+
Pistacia Lentiscus	+	*Helichrysum sanguineum*	+
Genista sphacelata	+	*Melica minuta*	+
Cistus villosus	1.2	*Origanum syriacum*	+
Cistus salvifolius	+	*Oryzopsis miliacea*	+
Stipa Aristella	2.2	*Phlomis viscosa*	+
Hypericum serpyllifolium	1.2	*Prasium majus*	+
Smilax aspera	1.2		

Other records of this association have been made in the following localities: Mt. Carmel, opposite Athlit; ibidem, descent to W. Bestan; ibidem, between Ain Haud and Khirbet Ruqtiya; ibidem, descent to W. Falah; Upper Galilee, env. of Yirka. Also observed near Hebron, at Beit Mahsir (Judean Mountains), in Um-Safa (Samaria) and S. of Jarash (Gilead).

(2) *Quercetum ithaburensis* (Eig 1933)

The history, distribution and floristic composition of the association have been discussed in detail in a previous paper (Eig 1933).

(3) Association of *Quercus calliprinos-Pistacia palaestina* (Eig 1938) Pl.VB

(a) *typicum*

Sample record: Judean Mountains; at km. 24 of the Jerusalem-Hebron road; alt. 820 m.; Cenomanian, compact dolomitic rock, between the rocks terra-rossa slightly covered with stones; exp. W; sl. 10-15°; ar. 200m²; cov. 80%.

Quercus calliprinos	3.3	*Cistus villosus*	2.2
Pistacia palaestina	2.3	*Cistus salvifolius*	2.2
Arbutus Andrachne	2.3	*Nepeta curviflora*	+.1
Styrax officinalis	2.3	*Salvia hierosolymitana*	+.2
Quercus infectoria	+.3	*Ajuga chia*	+.1
Pirus syriaca	+.3	*Helichrysum sanguineum*	+.2
Rhamnus palaestina	+.3	*Cirsium phyllocephalum*	+.1
Phlomis viscosa	+.2	*Lotus judaicus*	1.2
Origanum syriacum	+.2	*Campanula Rapunculus*	+.1
Micromeria nervosa	+.2	*Stipa Aristella*	+.1
Teucrium divaricatum	+.2	*Poa bulbosa*	1.2
Smilax aspera	1.2	*Cyclamen persicum*	+.1
Asparagus aphyllus	1.2	*Trifolium erubescens*	1.1
Rubia Olivieri	1.2	*Crepis hierosolymitana*	1.1
Tamus communis	+.1		

(b) *Lauretosum*

SAMPLE RECORD: Upper Galilee: env. of Yirka; alt. +470 m.; exp. N; sl. 50°; Cenomanian rocks, between them patches of rich humous soil; ar. 100 m²; cov. 100%.

Quercus calliprinos	4.4	*Oryzopsis miliacea*	2.2
Pistacia palaestina	1.3	*Hypericum serpyllifolium*	1.2
Laurus nobilis	1.3	*Umbilicus intermedius*	2.1
Phillyrea media	2.3	*Cyclamen persicum*	2.1
Arbutus Andrachne	1.3	*Arum palaestinum*	1.1
Rhamnus palaestina	1.2	*Pancratium parviflorum*	1.1
Viburnum Tinus	+.3	*Colchicum Decaisnei*	1.1
Clematis cirrhosa	1.3	*Narcissus Tazetta*	1.2
Smilax aspera	1.2	*Stachys distans*	1.2
Asparagus aphyllus	1.2	*Hypericum lanuginosum*	+
Lonicera etrusca	1.2	*Ceterach officinarum*	1.2
Tamus communis	1.2	*Polypodium vulgare*	1.2
Rubia Olivieri	1.2		

Records of this association (incl. both subassociations) have also been made in the following localities: Lower Galilee: env. of Nahalal; Mt. Carmel: env. of Wadi Bestan, Wadi Shumriya; Judean Mountains: between Zakariya and Beit Jibrin, env. of Deir esh Sheikh.

(4) Association of *Ceratonia Siliqua—Pistacia Lentiscus* (EIG 1938)

SAMPLE RECORD: Samaria, Wadi 'Ara; exp. S; sl. 20-30°; Cenomanian rocks and patches of typical terra-rossa between rocks; ar. 200m².; cov. 70%.

Ceratonia Siliqua	+.3	*Calycotome villosa*	1.2
Pistacia Lentiscus	3.3	*Rhamnus palaestina*	1.2
Phillyrea media	2.2	*Clematis cirrhosa*	1.2

Asparagus aphyllus	+	*Avena sterilis*	+
Rubia Olivieri	+	*Brachypodium distachyum*	+
Smilax aspera	+	*Bromus Alopecurus*	+
Ruta bracteosa	+	*Caucalis tenella*	+
Prasium majus	+	*Crucianella latifolia*	+
Phagnalon rupestre	+	*Galium hierosolymitanum*	+
Andropogon hirtus	+	*Geropogon glabrum*	+
Andropogon distachyus	1.2	*Lagoecia cuminoides*	+
Oryzopsis coerulescens	1.2	*Lavatera punctata*	+
Dactylis glomerata	+	*Pallenis spinosa*	+
Hordeum bulbosum	+	*Phalaris paradoxa*	+
Cephalaria joppica	1.1	*Pimpinella peregrina*	+
Aegilops speltoides	+	*Picris Sprengeriana*	+
Ainsworthia Carmeli	+	*Rhagadiolus stellatus*	+
Ajuga chia	+	*Stachys neurocalycina*	+
Artedia squamata	+	*Synelcosciadium Carmeli*	+

Records of this association have also been collected from the following localities: Mt. Carmel: descent of Wadi Bestan; Samaria: env. of Tayasir; Sharon: env. of Athlit, env. of Hedera.

Details on the composition of the psammophytic variant of this association are given in EIG (1939, p. 300).

(ii) Garigue associations:

(5) Association of *Cistus villosus- Cistus salvifolius* (EIG 1938)

SAMPLE RECORD: Judean Mountains: At km. 17 on the Jerusalem-Tel-Aviv road; exp. N; sl. 10°; small and medium-sized stones and patches of fine terra-rossa; ar. 100m² ; cov. 80%.

Cistus villosus	2.3	*Crocus hyemalis*	2.1
Cistus salvifolius	2.3	*Thrincia tuberosa*	2.1
Poterium spinosum	3.3	*Orchis anatolicus*	2.1
Pistacia Lentiscus stunted	+	*Orchis papilionaceus*	1.1
Prunus Amygdalus „	+	*Gladiolus segetum*	1.1
Quercus calliprinos „	+	*Ranunculus asiaticus*	1.1
Pistacia palaestina „	+	*Cyclamen persicum*	1.1
Rhamnus palaestina	+	*Bellis silvestris*	1.2
Phlomis viscosa	+	*Bellevalia flexuosa*	1.1
Calycotome villosa	+	*Anemone coronaria*	1.1
Teucrium divaricatum	1.2	*Arisarum vulgare*	+
Fumana thymifolia	1.2	*Salvia judaica*	1.1
Phagnalon rupestre	1.2	*Eryngium creticum*	+
Stachys cretica	+	*Cicer pinnatifidum*	1.1
Rubia Olivieri	1.2	*Asterolinum Linum-stellatum*	+
Asparagus aphyllus	1.2	*Crupina Crupinastrum*	+
Tamus communis	1.1	*Plantago Psyllium*	+
Smilax aspera	+		

Other records of this association have been collected in the following localities: Mt. Carmel: env. of Wadi Shallala; descent to

Wadi Falah, opposite Athlit; Samaria: env. of Umm Safa; Judean Mountains: env. of Deir esh Sheikh; at km. 20 on the Jerusalem-Tel Aviv road; Shephela: env. of Ramath-Gan.

(6) *Calycotometum villosae* (EIG 1935)

SAMPLE RECORD: Samaria: Wadi Far'a near Talluza, hill of Nari rocks with very soft, deep terra-rossa, stoneless within and gravelly on the surface; ar. 100m² ; cov. 80%.

Calycotome villosa	3.3	*Bromus scoparius*	+
Rhamnus palaestina	+	*Catananche lutea*	+
Carlina corymbosa	1.2	*Caucalis tenella*	+
Teucrium Polium	1.2	*Convolvulus siculus*	+
Vartemhia iphionoides	1.2	*Convolvulus pentapetaloides*	+
Andropogon hirtus	1.2	*Daucus subsessilis*	+
Echinops Blanchepanus	1.2	*Erucaria Boveana*	+
Anchusa strigosa	+	*Galium judaicum*	+
Retama Duriaei	+	*Geropogon glabrum*	+
Convolvulus Dorycnium	+	*Hedypnois cretica*	+
Linaria aegyptiaca	+	*Koeleria phleoides*	+
Asphodelus microcarpus	+	*Linum nodiflorum*	+
Heliotropium rotundifolium	+	*Mericarpea vaillantioides*	+
Ballota undulata	+	*Minuartia decipiens*	+
Cynodon dactylon	+	*Nardurus orientalis*	+
Bromus fasciculatus	1.1	*Notobasis syriaca*	+
Centaurea hyalolepis	1.1	*Onobrychis caput-galli*	+
Delphinium peregrinum	1.1	*Picris Sprengeriana*	+
Evax palaestina	1.1	*Plantago cretica*	+
Plantago Lagopus	1.1	*Pterocephalus involucratus*	+
Salvia Horminum	1.1	*Rapistrum rugosum*	+
Allium stamineum	+	*Rhagadiolus stellatus*	+
Anagallis coerulea	+.1	*Urospermum picroides*	+
Anthemis pseudocotula	+	*Vaillantia hispida*	+
Atractylis cancellata	+	*Zizyphus Lotus* (outside the area)	+
Avena sterilis	+		

Two other records have been taken from Samaria, 18 km. E of Tayasir, and from Wadi el Jahir.

(iii) Batha (dwarf-shrub) associations:

(7) *Poterietum spinosi mediterraneum* (EIG 1938) Pl. V C

SAMPLE RECORD: Judean Mountains: env. of Beit Jimal; exp. E; sl. 15°; somewhat stony terra rossa with Cenomanian rocks projecting from soil surface; area 100 m²; cov. 75%.

Poterium spinosum	4.3	*Origanum syriacum*	1.2
Pistacia Lentiscus	+.2	*Rubia Olivieri*	1.2
Rhamnus palaestina	+.2	*Asparagus aphyllus*	1.2
Teucrium Polium	1.2	*Andropogon hirtus*	1.2
Salvia triloba	1.2	*Crocus hyemalis*	1.1

Orchis papilionaceus	1.1	*Erodium gruinum*	1.1
Ophrys fusca	+	*Galium judaicum*	1.1
Ornithogalum Eigii	+	*Geranium molle*	+
Thrincia tuberosa	1.1	*Hippocrepis unisiliquosa*	1.1
Cyclamen persicum	1.1	*Hymenocarpus circinnatus*	+
Asphodelus microcarpus	+	*Helianthemum salicifolium*	1.1
Anemone coronaria	1.1	*Helianthemum aegyptiacum*	1.1
Ranunculus asiaticus	1.1	*Lathyrus Cicera*	+
Lotus judaicus	1.2	*Medicago tuberculata*	1.1
Minuartia tenuifolia	2.1	*Onobrychis squarrosa*	+
Biscutella didyma	2.1	*Plantago cretica*	1.1
Bromus madritensis	2.1	*Polygala monspeliaca*	1.1
Anagallis coerulea	+	*Tetragonolobus palaestinus*	+
Anthemis sp.	+	*Thlaspi perfoliatum*	1.1
Callipeltis cucullaria	1.1	*Valerianella vesicaria*	1.1
Coronilla scorpioides	1.1	*Vicia peregrina*	1.1
Chaetosciadium trichospermum	1.1	*Vicia palaestina*	1.1

Records of this association are also available from the following localities: Lower Galilee: env. of Sheikh Bureik, env. of Iksal; Samaria: env. of Jenin and Sabastiya; Judean Mountains: between Motsa and Kiryath Anavim at km. 17 on the Jerusalem-Tel Aviv road; env. of Bab el Wad; env. of Bethlehem; at km. 10 and 41 on the Jerusalem-Beit Jibrin road; at km. 64 on the Jerusalem-Beersheba road; env. of Atarot and Ramallah; env. of Migdal Eder; Kefar Etsion; Acre Plain: env. of W. Kurdani; Sharon: env. of Pardess Hanna and Karkur; between Sheikh Muwannis and Herzliya; Shephela env. of Rishon le Zion.

(8) *Poterietum spinosi orientale* (Eig 1938)

Sample record: Judean Mountains: between Hebron and Kafr Tarqumiya; hillside covered with debris; sl. 60°; white-greyish loose soil; cov. 40%.

Poterium spinosum	2.2	*Heliotropium rotundifolium*	1.2
Ballota undulata	1.2	*Echium angustifolium*	+
Salvia graveolens	1.2	*Salvia triloba*	+
Thymus capitatus	1.2	*Origanum syriacum*	+
Anchusa strigosa	1.1	*Andropogon hirtus*	+
Noea mucronata	1.2	*Poa Hackeli*	1.2
Teucrium Polium	1.2	*Cyclamen persicum*	+
Verbascum eremobium	+	*Asphodelus microcarpus*	+

Other records of this association have been collected from: Judean Mountains: Mt. Scopus; Judean Desert: at km. 8, 11, 12, 13 on the Jerusalem-Jericho road; at km. 70 on the Jerusalem-Beersheba road; between Hebron and Bani Naim; env. of Bani Naim; between Bani Naim and Bir Rutmiya, slope of Wadi el Abiad; between Taiyiba and Ain el Auja, env. of Jebel Najama; Wadi

Malih (N. of W. Far'a); between Wadi Far'a and Nablus; env. of Ain el Balata.

(9) *Thymetum capitati* (EIG 1938)

SAMPLE RECORD: Judean Desert: between Jerusalem and Khirbeth Arkub; Senonian soft rock.

Thymus capitatus	2.2	*Helianthemum salicifolium*	+
Fumana thymifolia	1.2	*Helianthemum vesicarium*	1.2
Poterium spinosum	1.2	*Herniaria cinerea*	+
Noea mucronata	1.2	*Hirschfeldia incana*	+
Artemisia Herba-alba	+.2	*Koeleria phleoides*	+
Alkanna strigosa	+.2	*Lagoseris obovata*	+
Astragalus sanctus	+	*Linum strictum*	+
Ononis Natrix	+	*Lithospermum tenuiflorum*	+
Carlina corymbosa	+	*Matthiola longipetala*	+
Aegilops Kotschyi	+	*Minuartia picta*	+
Anagallis coerulea	+	*Muscari racemosum*	+
Anthemis pseudocotula	+	*Nardurus orientalis*	+
Biscutella didyma	+	*Onobrychis squarrosa*	+
Bromus fasciculatus	+	*Papaver Argemone*	+
Carrichtera annua	+	*Paronychia moabitica*	+
Centaurea hyalolepis	+	*Pholiurus incurvus*	+
Cynosurus callitrichus	+	*Psilurus aristatus*	+
Elymus Delileanus	+	*Pterocephalus involucratus*	+
Erodium deserti	+	*Reseda alba*	+
Erucaria Boveana	+	*Rhagadiolus stellatus*	+
Evax palaestina	+	*Silene conoidea*	+
Gagea reticulata	+	*Vaillantia hispida*	+
Hedypnois cretica	+		

(10) Association of *Thymus capitatus-Andropogon hirtus*

This association has been investigated and published together with other associations of the light soils belt (EIG 1939: 295-298).

(11) *Salvietum graveolentis* (EIG 1938)

Characteristic habitat: white chalky and soft soil at the lower part of slopes.

SAMPLE RECORD: Southern part of the Judean Desert at km. 70 on the Jerusalem-Beersheba road; steep slope of hill; white greyish, gravely, deep soil; exp. SE; area 100m²; cov. 65%.

Salvia graveolens	1.3	*Astragalus sanctus*	+.2
Ballota undulata	+.2	*Salvia lanigera*	+
Echinops Blancheanus	+.1	*Linaria aegyptiaca*	+.2
Alkanna strigosa	+.2	*Malabaila Sekakul*	+
Atractylis serratuloides	1.2	*Pituranthus tortuosus*	+.2
Asphodelus microcarpus	1.2	*Heliotropium rotundifolium*	+.2
Astragalus Feinbruniae	1.2	*Thymelaea hirsuta*	+.2
Achillea Santolina	+	*Allium stamineum*	+.1

Poa Eigii	1.2	*Erodium gruinum*	+
Carex pachystylis	2.3	*Erodium malacoides*	+
Scorzonera papposa	+	*Filago prostrata*	+
Tulipa montana	+	*Heliotropium Bovei*	+
Carrichtera annua	1.1	*Linaria albifrons*	+
Erodium hirtum	1.1	*Onobrychis squarrosa*	+
Evax contracta	1.1	*Plantago Coronopus*	1.1
Gypsophila Rokejeka	+.2	*Plantago albicans*	+
Adonis dentata	+	*Phalaris minor*	+
Anagallis coerulea	+	*Pterocephalus involucratus*	+
Calendula arvensis	+	*Schismus arabicus*	+
Chaetosciadium trichospermum	+	*Reseda luteola*	+
Carthamus tenuis	+	*Spergularia diandra*	+
Crepis arabica	+	*Stipa tortilis*	1.1
Ericaria Boveana	+	*Trisetum macrochaetum*	+
Elymus Delileanus	+	*Torularia torulosa*	+

Also met with in the northern part of the Judean Desert.

(12) Association of *Poterium spinosum-Thymelaea hirsuta*

SAMPLE RECORD: Shephela, env. of Mughar; exp. W.; sl. 15°; compact black gravelly soil with scattered Kurkar stones; depth of compact 25-40 cm.; ar. 100 m²; cov. 75-80%.

Poterium spinosum	3.2	*Anagallis coerulea*	+
Thymelaea hirsuta	+.2	*Bromus scoparius*	+
Andropogon hirtus	1.2	*Carthamus tenuis*	+
Thymus capitatus	+.2	*Linum strictum*	+
Asphodelus microcarpus	1.2	*Crucianella herbacea*	+
Echium angustifolium	1.1	*Delphinium peregrinum*	+
Ononis stenophylla	+.2	*Galium setaceum*	+
Teucrium Polium	+.2	*Onobrychis caput-galli*	+
Dianthus multipunctatus	+	*Paronychia argentea*	+
Ajuga Iva	+	*Pterocephalus involucratus*	+
Poa Hackeli	2.2	*Psilurus aristatus*	+
Scorzonera papposa	+	*Plantago albicans*	+
Ranunculus asiaticus	+	*Salvia Horminum*	+
Plantago cretica	3.2	*Trifolium tomentosum*	+
Lygia passerina	1.1	*Trifolium campestre*	+
Aegilops variabilis	+		

(13) *Echinopetum Blancheani* (EIG 1938)

This association is nearest to the association of *Noëa mucronata-Ononis Natrix* differing from the latter by the higher sociability of *Echinops*, the absence of *Noëa*, as well as by its geogr. distribution. While the *Echinopetum* mainly occurs N of the Jerusalem-Jericho road, the *Noëa-Ononis* association is mainly limited to the S of the road. The characteristic habitat of this association is transported soft soil in wadi beds.

SAMPLE RECORD: Judean Desert: Wadi Far'a, upper part of canyon; alt. —170m.; exp. N; sl. 50°; steep hills covered with debris; grey, more or less soft steppe soil; cov. 100%.

Echinops Blancheanus	4.5	*Ephedra Alte*	+.2
Carlina corymbosa	1.2	*Anchusa strigosa*	+
Salvia graveolens	1.3	*Poa Eigii*	1.1
Ballota undulata	1.2	*Bromus fasciculatus*	2.1

Other records of this association have been taken from Samaria: between Nablus and Tubas and the env. of Nablus; Judean Desert: at km. 18, 20, 23 on the Jerusalem-Jericho road.

(14) *Ononidetum Natricis*

Characteristic habitat: White, chalky, soft soil, derived from Campanian rocks. This soil is often ploughed and the association usually occurs on abandoned fields. In this regard the *Ononidetum* is a more or less secondary association. *Poterietum spinosi* probably does not develop in this habitat. It seems, however,possible that this habitat has once been covered by Maquis which have been destroyed.

The species characteristic of this association are: *Onopordon palaestinum, Silene longipetala, Verbascum eremobium, Alkanna strigosa, Scrophularia xanthoglossa, Ononis leiosperma, Erysimum crassipes, Arrhenatherum palaestinum.* The latter three species are confined to deep or moist soil. The annuals characteristic of this association are: *Psilurus aristatus, Evax palaestina, Minuartia picta, Daucus subsessilis, Carthamus tenuis.*

The *Ononidetum* displays certain floristic and ecologic features common with the *Noëa mucronata - Ononis Natrix* association.

This association is subdivided into a few subassocations, not yet adequately distinguished. The following record is from a more or less typical form.

SAMPLE RECORD: Judean Mountains: Jerusalem, Mt. Scopus; exp. E; sl. 20°; soft and deep (Campanian) soil, slightly gravelly; ar. 100m²; cov. 60%.

Ononis Natrix	3.3	*Arrhenatherum palaestinum*	+.2
Poterium spinosum	+.2	*Muscari racemosum*	+
Scrophularia xanthoglossa	1.1	*Psilurus aristatus*	2.1
Noea mucronata	1.2	*Evax palaestina*	1.1
Onopordon palaestinum	+	*Minuartia picta*	1.1
Heliotropium rotundifolium	+.2	*Anthemis pseudocotula*	1.1
Carlina corymbosa	+.2	*Anagallis coerulea*	+
Alkanna strigosa	+.2	*Carthamus tenuis*	+
Verbascum eremobium	+.2	*Centaurea iberica*	+
Echium angustifolium	+.2	*Centaurea hyalolepis*	+
Polygonum equisetiforme	+.2	*Ceratocephalus falcatus*	+
Anchusa strigosa	+	*Daucus subsessilis*	+
Hypericum crispum	+.2	*Erucaria Boveana*	+
Silene longipetala	+	*Hedypnois cretica*	+

Koeleria phleoides	+	*Pimpinella cretica*	+
Matthiola longipetala	+	*Reseda alba*	+
Lagoecia cuminoides	+	*Rhagadiolus stellatus*	+
Onobrychis squarrosa	1.1	*Roemeria hybrida*	+
Papaver Rhoeas	+	*Scleropoa rigida*	+
Paronychia argentea	+		

Records of this association are also available from the Judean Desert: 4 km. E of Mt. Scopus, Jerusalem; 3 km. E of Taiyiba; Wadi el Habis.

B. Irano-Turanian associations

(i) *Artemision Herbae-albae* (Eig 1938) Pl. V D

This alliance comprises the following associations:

Artemisietum Herbae-albae Deserti-Judaici, subdivided into the following subassociations:

(a) *Ononidetosum Natricis,*
(b) *Astragaletosum spinosi,*
(c) *Poëtosum Eigii.*

Association of *Artemisia Herba alba-Asphodelus microcarpus*[1].

(15a) *Artemisietum Herbae-albae Ononidetosum*

Among the three subassociations of the *Artemisietum* the subassociation *Ononidetosum* is nearest to Mediterranean associations.

Ononis Natrix, Ballota undulata, Echinops Blancheanus, Elymus Delileanus, Anthemis pseudocotula, etc., most prominent in this subassociation, may serve as distinguishing floristical characteristic between this subassociation and the subassociation *Astragaletosum.* These species also emphasize the geographical affinities of this subassociation with the Mediterranean territory. *Bellevalia desertorum,* much more abundant here than in the subassociation *Astragaletosum,* reflects the particular edaphical conditions of this subassociation. *Noëa mucronata* occurs in all the three subassociations and so does *Erucaria Boveana.*

Sample record: Judean Desert: An Hud, about 7 km. E of Jerusalem; alt. about +700 m.; exp. S.; sl. 25°; cov. 75%.

Artemisia Herba-alba	2.3	*Carlina corymbosa*	+
Ononis Natrix	1.2	*Heliotropium rotundifolium*	+
Noea mucronata	2.3	*Salvia graveolens*	+
Ballota undulata	1.2	*Teucrium Polium*	+
Echinops Blancheanus	2.2	*Thymus capitatus*	+
Gypsophila Rokejeka	1.2	*Urginea maritima*	1.2
Alkanna strigosa	+	*Varthemia iphionoides*	+
Astragalus spinosus	+	*Aegylops Kotschyi*	+

[1] The associations: *Artemisia Herba alba - Rhenm palaestinum* and *Artemisia Herba alba - Astragalus adpressiusculus* recorded in Edom may also be included in this alliance.

Ajuga chia	+	*Hedypnois cretica*	+
Allium stamineum	+	*Helianthemum salicifolium*	+
Anagallis coerulea	+	*Hypericum crispum*	+
Anthemis pseudocotula	+	*Malabaila Sekakul*	+
Bellevalia desertorum	+	*Medicago tuberculata*	+
Bupleurum heterophyllum	+	*Onopordon palaestinum*	+
Carthamus nitidus	+	*Paronychia argentea*	+
Dactylis glomerata	+	*Picris Sprengeriana*	+
Elymus Delileanus	+	*Poa Eigii*	+
Erucaria Boveana	+	*Silene linearis*	+
Gagea rigida	+	*Vicia angustifolia*	+

(15b) *Artemisietum Herbae-albae Astragaletosum*

Characteristic species: *Astragalus spinosus* is present in nearly all records. Among the annuals there is a decrease in the number of Mediterranean species, and by this the subassociation in question differs from the subassociation *Ononidetosum*.

SAMPLE RECORD: Judean Desert: at km. 13 on the Jerusalem-Jericho road; alt. 255 m.; Exp. S.; soft rock, white shallow soil; ar. 50 m²; cov. 60-70%.

Artemisia Herba-alba	2.2	*Asphodelus microcarpus*	+
Astragalus spinosus	3.2	*Bellevalia desertorum*	+
Echinops Blancheanus	+	*Centaurea hyalolepis*	+
Gypsophila Rokejeka	+	*Crepis aspera*	+
Ononis Natrix	+	*Erodium gruinum?*	+
Carlina corymbosa	+	*Fagonia grandiflora*	+
Phlomis brachyodon	+	*Hymenocarpus circinnatus*	+
Achillea Santolina	+	*Silybum Marianum*	+
Alkanna strigosa	+		

(15c) *Artemisietum Herbae-albae Poëtosum*

Differs from the above mainly by the fact that *Poa Eigii* is always and *Carex pachystylis* often present. Geographically this subassociation occupies a more southern and probably also a more eastern district than the above subassociations. The presence of *Reichardia tingitana*, *Trigonella stellata* and others indicates that this subassociation is more steppic in character than the other two subassociations.

SAMPLE RECORD: Judean Desert: Wadi Dannun, E of Bethlehem; exp. NE; sl. 25°; soft rather deep soil covered with fine gravel; ar. 50 m²; cov. 75%.

Arthemisia Herba-alba	2.2	*Centaurea hyalolepis*	+
Poa Eigii	4.3	*Erucaria Boveana*	1.1
Noea mucronata	1.2	*Allium modestum*	+
Poterium spinosum	+	*Allium stamineum*	+
Echinops Blancheanus	+	*Alkanna strigosa*	+
Gypsophila Rokejeka	+	*Astragalus tribuloides*	+
Salvia lanigera	+	*Bupleurum heterophyllum*	+

Bupleurum semicompositum	+	*Onobrychis squarrosa*	+
Crepis arabica	+	*Papaver Rhoeas*	+
Delphinium flavum	+	*Picris damascena*	+
Erodium aegyptiacum	+	*Plantaga Coronopus*	+
Erodium malaccoides	+	*Reichardia tingitana*	+
Euphorbia chamaepeplus	+	*Reseda decursiva*	+
Gagea rigida	+	*Spergularia diandra*	+
Linaria albifrons	+	*Thlaspi perfoliatum*	+
Medicago laciniata	+	*Trigonella stellata*	+

Records of *Artemisietum Herbae-albae Deserti-Judaici* (incl. the subassociations) have also been taken from env. of Al Eizariye; env. of Far'a; at kms. 4, 5, 8, 9, 10, 11, 13 E of Jerusalem; env. of Bani Naim (E of Hebron); env. of Deir Allah (E of Bethlehem).

(16) Association of *Artemisia Herba-alba - Asphodelus microcarpus*

Characteristic species: *Atractylis serratuloides, Salvia lanigera,* etc.

SAMPLE RECORD: Negev, hills of Kurnub; alt. 460 m.; exp. S; sl. 15°; split and disintegrated stones and boulders; scanty, very soft soil; cov. 20-25%.

Artemisia Herba-alba	2.2	*Carrichtera annua*	+
Asphodelus microcarpus	+.2	*Erodium hirtum*	+
Zygophyllum dumosum	+.2	*Gagea rigida*	+
Anabasis articulata	+.2	*Halogeton alopecuroides*	+
Gymnocarpon fruticosum	+.2	*Helianthemum kahiricum*	+
Atractylis serratuloides	+.2	*Iris Sisyrinchium*	+
Centaurea lanulata	+.1	*Plantago Coronopus*	+
Caralluma Aaronis	+	*Plantago ovata*	+
Salvia lanigera	+	*Salsola inermis*	+
Allium sp.	+	*Schismus arabicus*	+
Atractylis serratuloides	+	*Stipa tortilis*	+
Bellevalia desertorum	+	*Trigonella stellata*	+

Records of this association are also available from the following localities: Negev: at kms. 3-4, 5-6 on the Beersheba-Asluj road; kms. 10-11 E of Beersheba; S. of Ras Zuweira; between Sharia' and Wadi 'Ar'ara; env. of Asluj; env. of Kurnub.

(ii) *Haloxylonion articulati* (EIG 1938)

Floristically this alliance is distinguished from the *Artemision* by the absence of *Noëa mucronata,* usually present in the latter. It comprises the following associations (17, 18, 19):

(17) Association of *Haloxylon articulatum-Salsola villosa*

Colchicum Ritchii, Iris Sisyrinchium, Poa sinaica, Carex pachystylis, Salsola vermiculata ssp. *villosa, Helianthemum salicifolium, Erodium deserti, Haloxylon articulatum, Scorzonera judaica* are frequent in this association.

SAMPLE RECORD: Transjordan: 34 km. S. of Amman (env. of Ziza) compact alluvial, stoneless soil; cov. 85%.

Haloxylon articulatum	1.2	*Allium Artemisietorum*	+
Salsola vermiculata ssp. *villosa*	3.3	*Gagea reticulata*	+
Carex pachystylis	3.3	*Helianthemum salicifolium*	1.1
Poa sinaica	3.3	*Erodium deserti*	1.1
Colchicum Ritchii	1.1	*Astragalus tribuloides*	+.1
Bellevalia Zoharyi	+	*Iris Sisyrinchium*	+

Records of this association have also been taken at kms. 32, 35, 38, 48 and 53 S of Amman and from the Deserts of Moab at km. 94 S of Amman.

(18) Association of *Anabasis Haussknechtii-Poa sinaica*

Characteristic habitat: It is an Irano-Turanian association mainly confined to depressions of stoneless soil.

Characteristic species: In the spring aspect *Poa sinaica* and *Carex pachystylis* are abundant. In general this association comprises many geophytes and other perennials. Floristically it differs from the above association (*Haloxylon-Salsola*) by the following: *Anabasis Haussknechtii* never occurs together with *Salsola vermiculata* in one association; *Colchicum Ritchii, Iris Sisyrinchium, Carex pachystylis, Scorzonera judaica, Erodium deserti* and *Helianthemum salicifolium* are more frequent in the *Haloxylon-Salsola* association than in the *Anabasis-Poa* association; Saharo-Sindian annuals are more frequent in the former than in the latter. On the other hand *Artemisia Herba-alba, Scorzonera pusilla,* etc. present in this association are altogether lacking in the *Anabasis-Poa* association.

SAMPLE RECORD: Transjordan: env. of Ziza (29 km. S. of Amman); depression, compact alluvial, slightly stony soil (loess); ar. 100 m²; cov. 85-90%.

Anabasis Haussknechtii	1.2	*Colchicum Ritchii*	+
Poa sinaica	4.5	*Muscari longipes*	1.1
Artemisia Herba-alba	+.2	*Bellevalia desertorum*	2.3
Astragalus platyrrhaphis	+	*Helianthemum salicifolium*	1.1
Scorzonera pusilla	+	*Filago prostrata*	1.2
Iris Sisyrinchium	1.1	*Ranunculus asiaticus*	+.2
Carex pachystylis	+.2	*Torularia torulosa*	+

Records of this association are also available from kms. 32, 66, 83 and 110 km. S. of Amman.

(19) Association of *Anabasis Haussknechtii-Plantago Coronopus*

Characteristic habitat: This is an Irano-Turanian association, developing in deep loess soil ploughed once in 2-3 years and fit for non-irrigated agriculture. Characteristic species: *Malva aegyptia* and *Plantago Coronopus* are indicators of cultivation; *Carex pachystylis* indicates Irano-Turanian conditions; *Poa sinaica* does not occur at all.

SAMPLE RECORD: Negev: junction of Wadi Milh and Wadi Mishash; loess soil left fallow for 1-2 years; alt. 350 m.; ar. 50 m^2; cov. 70%.

Anabasis Haussknechtii	2.2	*Schismus arabicus*	+
Plantago Coronopus	3.1	*Filago spathulata*	+
Plantago ovata	+	*Astragalus tribuloides*	+
Malva aegyptia	+		

Other records of this association have been taken from between Beersheba and Wadi Milh; 10 kms. NW. of Kurnub.

(iii) *Noëion mucronatae* (EIG 1938)

This alliance comprises the following associations:

Association of *Noëa mucronata-Ononis Natrix,* subdivided into the following subassociations:

(a) *typicum*

(b) *Bellevalietosum desertorum*

Noëetum mucronatae, subdivided into the following subassociations:

(a) *typicum*

(b) *Blepharidetosum edulis*

(20) Association of *Noëa mucronata-Ononis Natrix typicum*

This association is probably determined by edaphical conditions and appears to be secondary, since *Noëa* is less subject to destruction than *Poterium spinosum.* This association develops in the zone of transition between the Mediterranean and Irano-Turanian territories and belongs to those associations of this zone of which *Ononidetum Natricis* is the most characteristic.

The differences between the two associations of the *Noëion* are as follows: in the *Noëa-Ononis* association the Saharo-Sindian and Irano-Turanian annuals, such as *Pteranthus dichotomus, Statice Thouini, Senecio coronopifolius, Reboudia pinnata, Delphinium flavum, Erodium deserti, Carthamus nitidus, etc.* are almost wholly absent, whereas they are frequent in the *Noëetum.* Similarly *Ballota undulata, Ononis Natrix, Onopordon palaestinum, Micromeria nervosa, Origanum syriacum, etc.* typical of the *Noëa-Ononis* association, do not occur in most records of the *Noëetum.* The annual associates of the *Noëa-Ononis* association are plants of the Mediterranean territory or of the Med.-Irano-Turanian transitional zone.

As to the *Noëa-Ononis* association, it probably forms a link of the following degradation series: When *Poterium* is cut for fuel in the *Poterietum spinosi orientale, Noëa* becomes dominant and the association *Noëa-Ononis* comes into appearance. Such areas turn into the *Ononidetum* if cultivated and later abandoned. On patches of coil situated between rocks, *Echinops Blancheanus* may become dominant in the case that *Noëa* is cut for fuel.

SAMPLE RECORD: Judean Desert: at km. 8 on the Jerusalem-Jericho road; alt. +415 m.; exp. N; sl. 10-15°; valley between hills;

deep terra-rossa mixed and covered with small stones and gravel; cov. 85-90%.

Noea mucronata	2.2	*Bellevalia flexuosa*	1.1
Ononis Natrix	2.2	*Scilla autumnalis*	1.1
Poa Eigii	3.4	*Anemone coronaria*	1.1
Ballota undulata	1.2	*Geranium tuberosum*	+
Varthemia iphionoides	1.2	*Muscari racemosum*	+
Carlina corymbosa	1.1	*Carthamus tenuis*	1.1
Teucrium Polium	+	*Crepis aspera*	1.1
Linaria aegyptiaca	+	*Erucaria Boveana*	1.2
Alkanna strigosa	+	*Onobrychis squarrosa*	1.1
Althaea acaulis	+	*Trigonella monspeliaca*	+
Onopordon palaestinum	+	*Erodium cicutarium*	+
Verbascum eremobium	+	*Erodium gruinum*	+
Ajuga chia	+	*Paronychia argentea*	+
Gypsophila Rokejeka	+	*Reseda alba*	+
Verbascum sinaiticum	+	*Silybum Marianum*	+
Ranunculus asiaticus	2.1		

Records of the above association (incl. both subassociations) were also taken from other localities of the Judean Desert: Mt. Scopus; Al Eizariya; env. of Abu Dis; foot of Jebel Najama; Wadi Abu Hindi; top of Jebel Muntar.

(21) *Noëetum mucronatae typicum* Pl. VI A

This is a typical Irano-Turanian association, well defined phyto-sociologically, ecologically and floristically. It seems to be nearest to *Ononidetum Natricis* on the one hand and *Echinopetum Blancheani* from the other. In Palestine it is rather limited in distribution, but well represented on the Jerusalem-Jericho road at kms. 16-17 and 19-20, where it occupies a rather broad belt.

SAMPLE RECORD: Judean Desert: at km. 18 on the Jerusalem-Jericho road; exp. NNW; sl. 15°; grey, compact, gravelly soil, with few boulders; ar. 100 m²; cov. 80%.

Noea mucronata	3.3	*Calendula aegyptiaca*	+
Salsola vermiculata ssp. *villosa*	+.2	*Carthamus tenuis*	+
Gypsophila Rokejeka	1.2	*Delphinium flavum*	+
Echinops Blancheanus	+	*Elymus Delileanus*	+
Teucrium Polium	1.2	*Emex spinosus*	+
Phagnalon rupestre	+	*Evax palaestina*	+
Poa Eigii	3.4	*Filago prostrata*	+
Centaurea hyalolepis	2.2	*Hedypnois cretica*	+
Erucaria Boveana	2.1	*Helianthemum ledifolium*	+
Statice Thouini	1.1	*Iris Sisyrynchium*	+
Allium hierochuntinum	+	*Matthiola longipetala*	+
Anthemis pseudocotula	+	*Medicago laciniata*	+
Astragalus callichrous	+	*Ononis Sicula*	+
Aegilops Kotschyi	+	*Pimpinella cretica*	+

Plantago Coronopus	+	*Stipa tortilis*	+
Senecio coronopifolius	+		

Records of this association (incl. both subassociations) have also been taken from other parts of the Judean Desert: at kms. 16, 17, 18, 19, 20-21 on the Jerusalem-Jericho road; at Khan al Hatrur and near the descent to Wadi Fuar on the Jerusalem-Jericho road; Bir Iskerieh (E of Bethlehem).

The subassociation *Blepharidetosum* differs from the subassociation *typicum* mainly in the presence of *Blepharis edulis* and probably also in the occurrence of *Koelpinia linearis, Aaronsohnia Faktorovskyi* and *Gymnarrhena micrantha.* Besides, *Poa Eigii* and *Carex pachystylis* are represented to a less degree in the subassociation *Blepharidetosum* than in *typicum.*

(iv) *Retamo-Phlomion brachyodontis* (EIG 1938) Pl. VI B

This alliance is mainly confined to Cenomanian and Santonian rocks; it also occurs on Nari (hard crust) of Maestrichtian rocks and probably also in Pliocene rocks. It does not occur on Campanian layers. It is represented best in the northern part of the Judean Desert and is of minor importance in the Negev. Among its characteristic species the following are to be mentioned: *Retama Duriaei, Phlomis brachyodon, Statice Thouini, Blepharis edulis, Teucrium Polium.* This alliance comprises the following associations:

Phlomidetum brachyodontis, subdivided into the following subassociations:

(a) *typicum,*
(b) *Eryngietosum glomerati,*
(c) *Thymelaeetosum hirsutae;*

Association of *Phlomis brachyodon-Blepharis edulis,* subdivided into the following subassociations:

(a) *typicum,*
(b) *Convolvuletosum Dorycnii;*

Association of *Retama Duriaei*[1]- *Blepharis edulis,* subdivided into the following subassociations:

(a) *typicum,*
(b) *Periplocetosum aphyllae;*

Association of *Retama Duriaei - Rhus oxyacanthoides.*

(22) *Phlomidetum brachyodontis typicum*

In its typical form this association appears in the central part of the Judean Desert. Here it is confined mainly to Santonian rocks but also occurs on the decomposed Nari cover overlaying the Maestrichtian layers. Compact, more or less deep soil covered and slightly intermixed with gravel is most typical of this association, occurring

[1] The specific name has been changed from *R. Roetam* in accordance with a recent investigation (ZOHARY, *Pal. Journ. Bot.* J Series. 3:180—182, 1945).

mostly on slightly sloping ground. On the Jerusalem-Jericho road it is abundant between the kms. 10 and 16.

Floristically it is characterized by high coverage of *Poa Eigii*, *Carex pachystylis* (requiring compact soil retaining moisture after the rains) and *Faktorovskya Aschersoniana*. *Helianthemum salicifolium*, *Evax contracta*, *Erucaria Boveana* also take part in the vernal aspect of the association. Among the perennials *Dianthus multipunctatus* and *Asphodelus microcarpus* may be regarded as most typical for this association within the district in question.

The subassociation *Eryngietosum* has a restricted though well defined distributional area. It links the *Phlomidetum* geographically, ecologically and floristically with the *Phlomis-Blepharis* association. The subassociation *Thymelaeetosum* is only fragmentary according to our records linking the *Retamo-Phlomion* and the *Salvietum graveolentis* (which apparently belongs to the *Ononion Natricis*), on one hand, with the *Phlomidetum* and the *Phlomis-Blepharis* association on the other.

Sample record: Judean Desert: at km. 15 on the Jerusalem-Jericho road; alt. +340 m.; Santonian low hill, gravelly soil between rocks; exp. E; cov. 60%.

Phlomis brachyodon	3.3	*Calendula aegyptiaca*	+
Varthemia iphionoides	1.2	*Calendula palaestina*	+
Anchusa strigosa	1.2	*Centaurea hyalolepis*	+
Asphodelus microcarpus	1.2	*Cichorium pumilum*	+
Echinops Blancheanus	+.1	*Crepis aspera*	+
Noea mucronata	1.2	*Erucaria Boveana*	+
Teucrium Polium	1.2	*Faktorovskya Aschersoniana*	+
Ononis Natrix	+	*Filago prostrata*	+
Carlina corymbosa	+	*Hirschfeldia incana*	+
Echium angustifolium	+	*Hippocrepis unisiliquosa*	+
Salsola vermiculata ssp. *villosa*	+	*Helianthemum salicifolium*	+
Lactuca orientalis	+	*Koeleria phleoides*	+
Eryngium creticum	+	*Linum strictum*	+
Linaria aegyptiaca	+	*Notobasis syriaca*	+
Artemisia Herba-alba	+	*Notoceras bicorne*	+
Dianthus multipunctatus	+	*Ononis reclinata*	+
Poa Eigii	3.3	*Plantago Coronopus*	+
Carex pachystylis	+.2	*Plantago Psyllium*	+
Iris Sisyrinchium	1.1	*Phalaris minor*	+
Erytrostictus palaestinus	+	*Paronychia sinaica*	+
Colchicum sp.	+	*Pterocephalus involucratus*	+
Evax contracta	1.1	*Reseda decursiva*	+
Anagallis coerulea	+	*Statice Thouini*	+
Atractylis cancellata	+	*Stipa tortilis*	+
Anchusa aegyptiaca	1.1	*Trigonella monspeliaca*	+

Records of this association (incl. its subassociations) have also been taken from the Judean Desert: at kms. 10, 11, 13, 14, 16, 16.5 on

the Jerusalem-Jericho road; between Wadi Hindi and Jebel Muntar; foot of Jebel Najama; slopes facing Wadi Auja; env. of Khirbet Arkub (E of Jerusalem); at km. 68 on the Jerusalem-Beersheba road (S of Dahariye); env. of Bir Rutmiye (E of Hebron); env. of Tekoa.

(23) Association of *Phlomis brachyodon-Blepharis edulis*

This association requires a less compact soil than that of *Phlomidetum brachyodontis*. Owing to these edaphical conditions *Poa Eigii*, *Carex pachystylis* and *Faktorovskya Aschersoniana* are almost absent here. Another floristical characteristic is the presence of *Zizyphus Lotus*, *Retama Duriaei*, *Atractylis serratuloides*, *Andropogon hirtus* and *Aristida adscensionis*. *Dianthus multipunctatus* does not occur; *Statice Thouini* is more common here than in the *Phlomidetum*; *Blepharis edulis* is abundant. This association is confined to the climax area of *Zizyphetum Loti* and *Retametum Duriaei*.

The subassociation *Convolvuletosum* is characterized by the occurence of *Convolvulus Dorycnium* and *Poa Eigii* (the latter only sparingly represented) and by the absence of *Zizyphus Lotus*.

SAMPLE RECORD of subassociation *typicum*: Upper Jordan Valley: border of Wadi Malih; exp. SE; sl. 20°; alluvial hill, compact very stony soil; cov. 75%.

Phlomis brachyodon	2.3	*Filago prostrata*	+
Blepharis edulis	2.2	*Aegilops variabilis*	+
Zizyphus Lotus	1.3	*Bupleurum heterophyllum*	+
Asphodelus microcarpus	1.1	*Calendula aegyptiaca*	+
Teucrium Polium	1.1	*Carthamus nitidus*	+
Carlina corymbosa	1.1	*Carrichtera annua*	+
Helianthemum rotundifolium	+	*Crepis aspera*	+
Iris Sisyrinchium	1.1	*Evax contracta*	+
Allium stamineum	+	*Evax palaestina*	+
Aristida adscensionis	1.2	*Daucus subsessilis*	+
Stipa tortilis	2.1	*Gagea reticulata*	+
Statice Thouini	1.1	*Plantago Coronopus*	+
Atractylis cancellata	1.1	*Plantago Psyllium*	+
Reboudia pinnata	1.1	*Cichorium pumilum*	+
Anagallis caerulaea	+	*Pterocephalus involucratus*	+
Astragalus callichrous	+	*Scabiosa palaestina*	+

Records of this association (incl. its subassociations) have also been taken from the following localities of the Jordan Valley: env. of Wadi Malih; env. of Wadi Far'a; env. of Khirbeth umm el Hasn; Ghor el Auja.

(24) Association of *Retama Duriaei-Blepharis edulis*

As compared with the association of *Phlomis-Blepharis* this association is characterized as follows: *Blepharis edulis*, *Aristida adscensionis*, *Andropogon hirtus* and *Convolvulus Dorycnium* are more

common here, *Zizyphus Lotus* lacks altogether; instead *Periploca aphylla, Balanites aegyptiaca* and *Aristida pumila* are present.

SAMPLE RECORD of subassociation *typicum*: Samaria: 7 km. E of Tayasir; exp. E; sl. 20°; soil slightly gravelly within and very gravelly on surface.

Retama Duriaei	2.3	*Heliotropium rotundifolium*	+
Blepharis edulis	1.2	*Aristida adscensionis*	+
Asphodelus microcarpus	2.2	*Salvia Horminum*	2.1
Alkanna strigosa	1.2	*Stipa tortilis*	1.1
Teucrium Polium	1.2	*Carrichtera annua*	+
Andropogon hirtus	1.2	*Calendula aegyptiaca*	+.
Phlomis brachyodon	+.2	*Erucaria Boveana*	+
Carlina corymbosa	+	*Hedypnois cretica*	+
Convolvulus Dorycnium	+.2	*Lygia passerina*	+

Records of this associations (incl. its subassociations) have also been taken from the foot of Samarian Mountains facing the Jordan Valley; at the descent to Sahel Majnin, env. of Ghor el Auja; env. of Wadi Far'a; betw. W. Far'a and Nablus; near Ain Fasayil; 7 km. S. of Ghor Far'a.

(25) Association of *Retama Duriaei-Rhus oxyacanthoides*

SAMPLE RECORD: Judean Desert: env. of Wadi Fuar; exp. E; sl. 30°; Cenomanian-Turonian flat rocks, plants mainly in crevices; ar. 100m²; cov. 15-20%.

Retama Duriaei	1.3	*Phagnalon rupestre*	+
Rhus oxyacanthoides	1.3	*Anthemis pseudocotula*	1.1
Varthemia iphionoides	2.2	*Campanula hierosolymitana*	1.2
Podonosma syriaca	2.2	*Carthamus nitidus*	1.1
Centaurea eryngioides	1.2	*Convolvulus siculus*	1.1
Gymnocarpus fruticosus	+.2	*Elymus Delileanus*	1.2
Salvia graveolens	+.2	*Koeleria phleoides*	1.1
Ononis Natrix	+.2	*Lagoecia cuminoides*	1.1
Ballota undulata	+.2	*Lamarckia aurea*	1.1
Teucrium Polium	+.2	*Medicago coronata*	1.1
Echinops Blancheanus	+.2	*Minuartia decipiens*	1.1
Origanum syriacum	+.2	*Ononis sicula*	1.1
Carlina corymbosa	+.2	*Plantago Psyllium*	1.1
Gypsophila Rokejeka	+.2	*Picris intermedia*	1.1
Linaria aegyptiaca	+.2	*Reichardia tingitana*	1.1
Micromeria nervosa	+.2	*Silene damascena*	1.1
Andropogon hirtus	+.2	*Stipa tortilis*	1.1
Ajuga chia	1.1	*Telmissa microcarpa*	1.1
Ornithogalum brachystachys	+	*Vaillantia hispida*	1.1
Paronychia moabitica	+	and many others.	

C. The Saharo-Sindian associations

(i) *Salsolion villosae*[1]

This alliance is closely related to the *Chenoleion arabicae*. It is included in this paper within the Saharo-Sindian vegetation, although some of its units occur within the boundaries of the Irano-Turanian territory. Its geographical distribution within Palestine comprises areas of the Judean Desert, the Lower Jordan Valley (dominant chiefly in the middle and in the mid-northern part of the Valley) and the Negev. The following associations are distinguished:

(1) *Salsoletum villosae*, subdivided into the following subassociations:

(a) *Poëtosum Eigii*,
(b) *Ammochloëtosum palaestinae*,
(c) *Scilletosum Hanburyi*;

(2) Association of *Salsola villosa-Gymnocarpus fruticosus*, subdivided into the following subassociations:

(a) *deserti-judaici*,
(b) *negevianum*,
(c) *jordanense*;

(3) Association of *Salsola villosa-Stipa tortilis*;

(4) Association of *Anabasis articulata-Notoceras bicorne*.

(26) *Salsoletum villosae* Pl. IV C

The subassociation *Poëtosum* is limited in the Judean Desert to conditions intermediate between those of the Irano-Turanian and Saharo-Sindian territories. It occurs on N and NW slopes apparently of both Danian and Maestrichtian hills. *Poa Eigii* shows high coverage (4-5), *Carex pachystylis* does not occur and *Reboudia pinnata* is very abundant. Among the perennials there are also plants requiring more or less deep soil, such as *Noëa mucronata*, *Reaumuria palaestina*, *Atriplex leucoclada*.

The subassociation *Ammochloëtosum* is floristically well defined; *Poa Eigii*, *Carex pachystylis*, *Centaurea sinaica*, *Ammochlora palaestina*, *Atractylis serratuloides* and probably also *Salsola inermis* are differential species.

The subassociation *Scilletosum* approaches the *Salsola-Stipa* association, and it is uncertain whether it is to be kept as a separate unit.

SAMPLE RECORD of subassociation *Poëtosum*: Judean Desert: at km. 21 on the Jerusalem-Jericho road; exp. NNE; sl. 15-20°; brown, deep and stoneless soil, compact and grainy and slightly covered with gravel; ar. 100 m².

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[1] *Salsola vermiculata* ssp. *villosa* is also named here *S. villosa*.

Salsola vermiculata ssp. *villosa*	2.3	*Erophila minima*	+
Poa Eigii	5.5	*Euphorbia chamaepeplus*	+
Noea mucronata	2.3	*Euphrasia latifolia*	+
Reboudia pinnata	2.1	*Fumaria micrantha*	+
Ranunculus asiaticus	1.1	*Gagea reticulata*	+
Plantago Coronopus	1.1	*Hypecoum procumbens*	+
Erucaria Boveana	1.1	*Herniaria cinerea*	+
Scorzonera papposa	+	*Lithospermum tenuifolium*	+
Anagallis coerulea	+	*Onobrychis squarrosa*	+
Anemone coronaria	+	*Ononis sicula*	+
Astragalus cruciatus	+	*Pimpinella cretica*	+
Bellevalia flexuosa	+	*Senecio vernalis*	+
Chaetosciadium trichospermum	+	*Silene colorata*	+
Convolvulus siculus	+	*Trigonella arabica*	+
Calendula aegyptiaca	+	*Vicia amphicarpa*	+
Statice Thouini	+		

Records of this association (incl. its subassociations) have also been taken from the following localities: Judean Desert: Jerusalem-Jericho road, 3 km. N of the entrance to Ain Fuar; at kms. 21 and 21,5 on the above road; Jebel Ekteif; al Buqueia; env. of Khirbeth Mird; Negev: env. of Ras Zuweira and Tel-Arad.

(27) Association of *Salsola villosa-Gymnocarpus fruticosus*

This association is mainly Saharo-Sindian, both geographically and floristically. It is well developed on rocks (intact, fissured or disintegrated) of Danian, Maestrichtian(?) and Santonian formations. Floristically this association displays a wide range of associates. *Poa Eigii* is rather rare, *Carex pachystylis* is altogether lacking; in the vernal aspect *Aaronsohnia Faktorovskyi, Reboudia pinnata, Statice Thouini* dominate. Among the dwarf-shrubs, *Zygophyllum dumosum* and *Halogeton alopecuroides* are significant. *Reaumuria palaestina, Artemisia Herba-alba* and *Noëa mucronata* also occur. The great number of perennials is, no doubt, due to the rocky character of the habitat, which under arid conditions gives shelter to perennials of less arid regions.

The subassociation *deserti-judaici* is of Irano-Turanian-Saharo-Sindian character. It occurs in the middle and southern part of the Judean Desert. The number of perennials is not great; *Poa* is poorly represented but constant.

The subassociation *negevianum* is Saharo-Sindian. It is characterized by a great number of perennials sheltered by the rocks.

The following is a SAMPLE RECORD of the subassociation *negevianum*: Negev: env. of Ras Zuweira; hillside; sl. 25°; Campanian-Maestrichtian rock, wheathering into white soil covered with flint gravel; cov. 25%.

Salsola vermiculata ssp. *villosa*	1.2	*Elymus Delileanus*	+
Gymnocarpus fruticosus	+.2	*Hippocrepis unisiliquosa*	+
Halogèton alopecuroides	1.2	*Matthiola longipetala*	+
Artemisa Herba-alba	+.2	*Onobrychis squarrosa*	+
Reaumuria palaestina	1.2	*Pterocephalus involucratus*	+
Astragalus spinosus	+.2	*Pteranthus dichotomus*	+
Astragalus sanctus	+	*Plantago Coronopus*	+
Centaurea aegyptiaca	+	*Reseda decursiva*	+
Chenolea arabica	+	*Reboudia pinnata*	+
Salsola lancifolia	+	*Salsola inermis*	+
Anabasis articulata	+.2	*Schismus arabicus*	+
Atriplex leucocladum	+	*Silene linearis*	+
Adonis dentata	+	*Statice Thouini*	+
Anthemis maris-mortui	+	*Stipa tortilis*	+
Bellevalia desertorum	+		

Records of this association (incl. its subassociations) have also been taken from the following localities: Judean Desert: at kms. 19.5 20, 20.5, 25.5 on the Jerusalem-Jericho road; env. of Wadi Shukf; env. of Wadi Nusraniyeh; Negev: env. of Naqb Zuweira and 3 km. E. of Zuweira (W. Umrej); Lower Jordan Valley: env. of Ghor el Far'a; env. of Daharet el Balka (near W. Far'a); Sahel Madhbeh (near W. Auja).

(28) Association of *Salsola villosa-Stipa tortilis*

This association is confined to the Jordan Valley as well as to the southern and eastern hillsides of the lower part of the Judean Desert. Within the Lower Jordan Valley it is mainly confined to Lisan Marl. It seems to be a climatic association in some parts of the Jordan Valley where it is confined to soils deprived of moisture. Floristically it is characterized by an almost absolute lack of perennials (including geophytes) and by the abundance of ephemerals. By the absence of *Poa Eigii, Carex pachystylis, Helianthemum salicifolium* etc. it is readily distinguished from the *Salsoletum villosae.*

SAMPLE RECORD: Lower Jordan Valley: 16 km. S of Wadi Far'a (on the Beisan-Jericho road); top of a "brokenland" hill; ar. 100 m².

Salsola vermiculata ssp. *villosa*	2.2	*Cichorium pumilum*	+
Stipa tortilis	1.1	*Erucaria Boveana*	+
Statice Thouini	1.1	*Gagea rigida*	+
Reaumuria palaestina	1.2	*Gymnarrhena micrantha*	+
Atractylis cancellata	1.1	*Medicago laciniata*	+
Aegilops Kotschyi	+	*Matthiola longipetala*	+
Allium stamineum	+	*Nigella deserti(?)*	+
Allium paniculatum	+	*Onobrychis squarrosa*	+
Anagallis coerulea	+	*Pteranthus dichotomus*	+
Carrichtera annua	+	*Plantago ovata*	+
Carthamus glaucus	+		

Records of this association are also available from other localities of the Lower Jordan Valley: 10 km. S of Wadi Far'a; at Daharath el Balka; near Jericho; Judean Desert: at the kms. 21.5 and 24 on the Jerusalem-Jericho road and at km. 32 on the Jerusalem-Kallia road.

(29) Association of *Anabasis articulata-Notoceras bicorne* Pl. VI D

SAMPLE RECORD: Lower Jordan Valley: at km. 33 on the Jerusalem-Kallia road, about 1 km. E of the road; compact, grey steppe soil mixed with fine gravel, surface strewn with stones and gravel; plain; ar. 100 m².

Anabasis articulata	2.2	*Aaronsohnia Faktorovskyi*	+
Notoceras bicorne	2.1	*Asphodelus tenuifolius*	+
Filago prostrata	2.2	*Astragalus callichrous*	+
Stipa tortilis	2.1	*Carrichtera annua*	+
Plantago ovata	1.1	*Erythrostictus palaestinus*	+
Aizoon hispanicum	1.1	*Erucaria Boveana*	+
Asteriscus pygmaeus	1.1	*Ononis sicula*	+
Gymnarrhena micrantha	1.1	*Papaver Rhoeas*	+
Matthiola aspera	1.1	*Picris intermedia*	+
Reseda decursiva	1.1	*Spergularia diandra*	+
Minuartia picta	1.1	*Trigonella stellata*	+
Silene setacea	1.1		

(ii) *Gymnocarpetum fruticosi*

This alliance comprises the following associations:

(30) *Gymnocarpetum fruticosi* (EIG 1938)

This association is generally homogenous in its composition and ecology. Although very near *Zygophylletum*, it is ecologically, geographically and floristically well distinguished from the latter. It is rather a Saharo-Sindian association harbouring many Mediterranean and Irano-Turanian species (*Varthemia iphionoides, Echinops Blancheanus, Gypsophila Rokejeka, Heliotropium rotundifolium, Teucrium Polium*). Edaphically and floristically it shows close affinities to the *Chenoleion* association series. It is best developed on a harder ground, as compared with that of *Zygophylletum dumosi*. *Erodium hirtum* and *Gymnarrhena micrantha* present in the *Zygophylletum*, do not occur in this association. On the other hand, *Erodium hirtum* — not found in *Zygophylletum* — is characteristic of the *Gymnocarpetum*. The following are frequent species of this association: *Echinops Blancheanus, Gypsophila Rokejeka, Noëa mucronata, Salsola vermiculata* ssp. *villosa, Fagonia grandiflora, Haplophyllum tuberculosum, Herniaria hemistemon, Erodium glaucum, Reaumuria palaestina, Heliotropium rotundifolium, Salvia aegyptiaca, Erucaria Boveana, Senecio coronopifolius, Notoceras bicorne, Aaronsohnia Faktorovskyi, Centaurea pallescens, Plantago Coronopus,*

Reichardia tingitana, Pteranthus dichotomus, Aegilops Kotschyi, Rumex roseus.

SAMPLE RECORD: Judean Desert: km. 22 on the Jerusalem-Jericho road; exp. E; sl. 15°; readily disintegrating Cenomanian rock; soil scarce between stones; ar. 50 m²; cov. 50%.

Gymnocarpus fruticosus	3.3	*Emex spinosus*	+
Atriplex leucocladum	2.2	*Euphorbia chamaepeplus*	+
Salsola vermiculata ssp. *villosa*	2.2	*Filago prostrata*	+
Echinops Blancheanus	1.1	*Galium setaceum*	+
Reaumuria palaestina	1.2	*Gagea rigida*	+
Heliotropium rotundifolium	1.2	*Herniaria hemistemon*	+
Gypsophila Rokejeka	+.2	*Iris Sisyrinchium*	+
Poa Eigii	1.2	*Matthiola longipetala*	+
Notoceras bicorne	1.1	*Ononis reclinata*	+
Asphodelus tenuifolius	1.1	*Pimpinella eriocarpa*	+
Delphinium flavum	1.1	*Pteranthus dichotomus*	+
Aaronsohnia Faktorovskyi	1.1	*Plantago Coronopus*	+
Erucaria Boveana	1.1	*Reboudia pinnata*	+
Alyssum marginatum	+	*Reichardia tingitana*	+
Allium stamineum	+	*Salvia aegyptiaca*	+
Calendula aegyptiaca	+	*Scabiosa Aucheri* (?)	+
Centaurea hyalolepis	+	*Senecio coronopifolius*	+
Daucus subsessilis	+	*Stipa tortilis*	+

Other records of this association have been taken from the following localities: Judean Desert: near km. 19, 20.5 on the Jerusalem-Jericho road; Wadi Sdeir (near Engeddi); Wadi Ghar.

(31) Association of *Gymnocarpus fruticosus-Zilla spinosa*

SAMPLE RECORD: Negev: between Aqaba and Kusseima (33 km. from the former); alt. +780 m.; valley between granite hills; gravely and sandy soil; ar. 400m².

Gymnocarpus fruticosus	2.3	*Zygophyllum dumosum*	+.2
Zilla spinosa	1.2	*Salvia deserti*	+.2
Acacia tortilis	+.3	*Daemia cordata*	+.2
Ochradenus baccatus	+.3	*Helianthemum ellipticum*	+.2
Retama Roetam	+.2	*Teucrium Polium*	+.2
Ephedra Alte	+.2	*Diplotaxis Harra*	+
Artemisia Herba-alba	1.2	*Paracaryum rugulosum*	+
Lycium europaeum (?)	+.3	*Aristida obtusa*	+.2
Anvillaea Garcini	1.2	*Aristida plumosa*	+.2
Polygala spinescens	1.2	*Gastrocotyle hispida*	+
Astragalus spinosus	1.2	*Schismus barbatus*	+
Farsetia aegyptiaca	1.2	*Stipa tortilis*	+
Fagonia sp.	+.2		

Other records of this association have been taken from the same region at km. 27 and 37 on the Aqaba-Kusseima road.

(iii) *Zygophyllion dumosi*

(32) *Zygophylletum dumosi* (EIG 1938) Pl. VI E

This is a typical Saharo-Sindian association, which may be considered the main association within the Saharo-Sindian territory of Palestine. It occurs on rocks, boulders, gravelly ground or compact soil, etc. However within its natural range it is also present on soft soil. Genetically and floristically it is nearest *Gymnocarpetum*. It is also probable that *Zygophylletum* is to be classed together with *Chenoleion* under the same order. A series of species of the *Chenoleion* are also met with in the *Zygophylletum*. These are: *Erodium hirtum, Helianthemum kahiricum, Chenolea arabica, Gymnocarpus fruticosus, Fagonia grandiflora, Herniaria hemistemon, Reichardia tingitana, Haplophyllum tuberculatum, Bellevalia desertorum.* The most frequent species of the *Zygophylletum* are: *Gymnocarpus fruticosus, Reaumuria palaestina, Stipa barbata, Halogeton alopecuroides, Anabasis articulata, Artemisia Herba-alba, Statice pruinosa, Helianthemum kahiricum, Erodium hirtum, Gagea rigida, Noëa mucronata, Atractylis serratuloides, Lappula spinocarpos, Chenolea arabica, Asteriscus pygmaeus, etc.*

SAMPLE RECORD: Judean Desert: E of Bani Naim, near Wadi Ghar; exp. S; cov. 20%.

Zygophyllum dumosum	2.3	*Allium modestum*	+
Salsola vermiculata ssp. *villosa*	+.2	*Atractylis cancellata*	+
Poa Eigii	+.3	*Antirrhinum Orontium*	+
Plantago ovata	+	*Erodium hirtum*	+
Aaronsohnia Faktorovskyi	+	*Matthiola aspera* var. *leiocarpa*	+
Acantholepis orientalis	+	*Pteranthus dichotomus*	+
Allium Artemisietorum	+	*Stipa tortilis*	+

Records of this association and its allied forms have also been taken from the following localities: Far Negev: env. of Asluj, env. of Kusseima; mountains near Kurnub; between Naqb Zuweira and Wadi Umrej; Judean Desert: between Wadi Ghar and Wadi Sdeir; between Khan Hatrur and km. 30 of the Jerusalem-Jericho road.

(iv) *Chenoleion arabicae* (EIG 1938)

This alliance comprises the following associations:

Association of *Erodium glaucophyllum-Herniaria hemistemon* subdivided into the following subassociations:

(a) *typicum,*
(b) *subirano-turanicum;*

Chenoleetum arabicae, subdivided into the following subassociations:

(a) *Bellevalietosum deserti,*
(b) *Helianthemetosum kahirici;*

Association of *Chenolea arabica-Salsola villosa.*

(33) Association of *Erodium glaucophyllum-Herniaria hemistemon*

This association is confined to soft rocks disintegrating in situ. These are mainly or exclusively of Danian formation. The species frequent in this association are *Erodium glaucophyllum, Herniaria hirsuta, Bellevalia desertorum, Gagea rigida* among the perennials. These species are by no means exclusives here. Frequent annuals are: *Astragalus tribuloides, Schismus arabicus* (?), *Filago spathulata, Euphorbia chamaepeplus, Stipa tortilis, Aaronsohnia Faktorovskyi, Senecio coronopifolius, Reichardia tingitana, Plantago ovata.* Exclusive species within the region of this association are *Launea Foxii, Lasiopogon muscoides, Leptaleum filifolium* and perhaps also *Koelpinia linearis* and *Arnebia decumbens.* However, these species occur only in the typical subassociation and not in the sub-irano-turanian. According to these exclusives and the dominance of Saharo-Sindian annuals in general this association may be subdivided into the following two subassociations: (a) *typicum* in which the dominating annuals are typically Saharo-Sindian, and which is limited to a strip between the kms. 26 and 31, on the Jerusalem-Jericho road, (b) *sub-irano-turanicum* in which the dominating annuals are mostly Mediteranean or Irano-Turanian, and which is limited between the kms. 18 and 20 on the above road. This subassociation may be regarded as a link between the *Erodium-Herniaria* association and the *Chenoleetum arabicae.*

Here is a SAMPLE RECORD of subassociation *typicum*: Judean Desert: near the km. 27 on the Jerusalem-Jericho road; Senonian hill; exp. SW; white, mealy, compact soil; ar. 50m²; cov. 40-50%.

Erodium glaucophyllum	2.1	*Atractylis cancellata*	+
Herniaria hemistemon	2.2	*Euphorbia chamaepeplus*	+
Salsola vermiculata ssp. *villosa*	+.2	*Filago spathulata*	+
Haplophyllum tuberculatum	+.1	*Herniaria cinerea*	+
Reseda muricata	+.1	*Leptaleum filiforme*	+
Astragalus tribuloides	1.1	*Linaria Haelava*	+
Aaronsohnia Faktorovskyi	1.1	*Matthiola aspera*	+
Erucaria Boveana	1.1	*Matthiola longipetala*	+
Lasiopogon muscoides	1.1	*Pteranthus dichotomus*	+
Launea Foxii (?)	1.1	*Medicago laciniata*	+
Notoceras bicorne	1.1	*Pterocephalus involucratus*	+
Trigonella stellata	1.1	*Reseda decursiva*	+
Asphodelus tenuifolius	+	*Schismus arabicus*	+
Asteriscus pygmaeus	+	*Senecio coronopifolius*	+
Arnebia decumbens	+	*Stipa tortilis*	+

This association (incl. its subassociations) has also been recorded from other localities in the Judean Desert: at kms. 18, 26, 29, 31-32 on the Jerusalem-Jericho road; 2-3 km. W of Nebi Musa; env. of Khan Hatrur.

(34) *Chenoleetum arabicae* Pl. VII A

This association differs floristically from the former by the presence of *Diplotaxis Harra, Erodium hirtum, Helianthemum kahiricum, Fagonia grandiflora, Centaurea lanulata, Halogeton alopecuroides*, etc. All these species do not occur in the *Erodium-Herniaria* association. On the other hand *Alkanna strigosa, Heliotropium rotundifolium, Atriplex palaestinum* and probably also a series of geophytes are present in the *Erodium-Herniaria* association and do not occur in the *Chenoleetum*.

The subassociation *Helianthemetosum* is confined to the district E and SE of Hebron. Its differential species are *Helianthemum kahiricum, Centaurea lanulata* and perhaps *Atriplex leucocladum*. The subassociation *Bellevalietosum* is confined to a more northern district of the Judean Desert and its differential species are *Bellevalia desertorum, Gypsophila Rokejeka, Erodium hirtum* and *Fagonia grandiflora*.

(a) SAMPLE RECORD of subassociation *Bellevalietosum*: Judean Desert: at km. 21 on the Jerusalem-Jericho road (opposite Wadi Rumani); alt. 160 m.; exp. SSW; sl. 25-30°; white, soft soil with a hardened crust, slightly gravelly on surface; cov. 70-75%.

Chenolea arabica	2.3	*Plantago Coronopus*	2.1
Bellevalia desertorum	2.1	*Reboudia pinnata*	2.1
Herniaria hemistemon	2.1	*Asphodelus tenuifolius*	+.1
Echinops Blancheanus	1.2	*Linaria Haelava*	1.1
Reseda muricata	1.1	*Euphorbia chamaepeplus*	1.1
Atriplex leucocladum	+.2	*Senecio coronopifolius*	1.1
Haplophyllum tuberculatum	1.2	*Schismus arabicus*	1.1
Erodium glaucophyllum	1.1	*Asphodelus tenuifolius*	+
Poa Eigii	+.2	*Centaurea hyalolepis*	+
Gypsophila Rokejeka	+.2	*Erucaria Boveana*	+
Salvia lanigera	+.2	*Filago prostrata*	+
Reaumuria palaestina	+.2	*Notoceras bicorne*	+
Aaronsohnia Faktorovskyi	3.2	*Reichardia tingitana*	+
Astragalus tribuloides	2.1	*Stipa tortilis*	+

(b) SAMPLE RECORD of subassociation *Helianthemetosum*: Judean Desert: Wadi Ghar, env. of Haj'Ain Hamam; alt. 200 m.; mountains slope, soft Campanian disintegrated rocks; exp. SE; sl. 10°; ar. 50 m².

Chenolea arabica	1.2	*Aaronsohnia Faktorovskyi*	+
Helianthemum kahiricum	1.2	*Plantago ovata*	+
Diplotaxis Harra	1.2	*Pteranthus dichotomus*	+
Herniaria hemistemon	+.1	*Stipa tortilis*	+
Erodium hirtum	+		

Other records of this association (incl. its subassociations) have been taken from the following localities: Judean Desert: at kms.

21, 22, 23, 24, 25, 25-26 on the Jerusalem-Jericho road; env. of Beni Naim (E of Hebron); Jebel Hasasa (above Wadi Nusraniyeh); env. of Khirbeth al Mird and Wadi Abu Sahile (near Khan el Mird); Negev: Wadi Umrej (near Naqb Zuweira).

(35) Association of *Chenolea arabica-Salsola villosa*

SAMPLE RECORD: Judean Desert: Wadi Shukf (near En-geddi); alt. —350 m.; exp. E; sl. 5-10°; hard Campanian rocks; gravelly soil; ar. 100m²; cov. 30%.

Chenolea arabica	2.2	*Ceratocephalus falcatus*	+
Salsola vermiculata ssp. *villosa*	+.2	*Carrichtera annua*	+
Reaumuria palaestina	+.2	*Delphinium flavum*	+
Atriplex palaestina	+.2	*Filago spathulata*	+
Anabasis articulata	+.2	*Iris Sisyrinchium*	+
Poa Eigii	1.2	*Nardurus orientalis*	+
Gagea rigida	+	*Notoceras bicorne*	+
Allium stamineum	+	*Plantago Psyllium*	+
Asteriscus pygmaeus	+	*Plantago Coronopus*	+
Atractylis cancellata	+	*Pterocephalus involucratus*	+
Anthemis maris-mortui	+	*Pteranthus dichotomus*	+
Acantholepis orientalis	+	*Reboudia pinnata*	+
Avena Wiestii	+	*Schismus arabicus*	+
Bellevalia desertorum	+	*Stipa tortilis*	+

Other records have been taken in the Judean Desert: at kms. 25 and 26 on the Jerusalem- Jericho road; Jebel Hasasa, env. of Wadi Nusraniyeh; Negev: env. of Naqb Zuweira (descent to W. Umrej); Moab: 114 km. S of Amman.

It is still uncertain whether this association belongs to the *Chenolevion arabicae.*

(v) *Anabasidion articulati*

This alliance apparently occupies soils of greater maturity than those occupied by *Salsolion villosae.*

(36) Association of *Anabasis articulata-Zilla spinosa* (Pl.VIIB) subdivided into the following units:

(a) *typicum,*
(b) *Noëetosum mucronatae,*
(c) *Asphodeletosum microcarpae.*

SAMPLE RECORDS of subassociation *Noëetosum*: Edom: 41 km. from Maan to Aqaba, plain of Wadi Hisma; Nubian sandstone, compact sandy soil; cov. 40%.

Anabasis articulata	1.2	*Atractylis flava*	+
Zilla spinosa	1.2	*Helianthemum ellipticum*	+.2
Noea mucronata	2.3	*Carex pachystylis*	2.1
Gymnocarpus fruticosus	+.2	*Aristida plumosa*	+
Retama Roetam	+.3	*Alkanna tinctoria*	+.2

Phaeopappus scoparius	+	*Bromus* sp.	+
Centaurea sp.	+	*Lotus villosus*	+
Colchicum Ritchii	+	*Astragalus* sp.	+

In the following localities other records of this association (incl. its subassociations) have been taken: Edom: 41, 43, 56, 61, 70, 77 kms. S of Maan (near the road to Aqaba); Negev: env. of Kurnub, Plain of Tureibe.

(vi) *Suaedion asphalticae* (EIG 1938)

(37) *Suaedetum asphalticae* (EIG 1938) Pl. VII C

This association is subdivided into the following units:

(a) subassociation *sub-irano-turanicum*:
  (1) facies *typicum*,
  (2) facies *Poosum Eigii*
(b) subassociation *saharo-sindicum*:
  (1) facies *Reboudiosum pinnatae*,
  (2) facies *Aaronsohniosum Faktorovskyi*.

This association is generally homogenous both ecologically (slope, soil) and floristically. No perennials occur as constant associates of *Suaeda*. Annuals occur in various combinations. *Poa Eigii* decreases in coverage towards S and E. Its occurrence is conditioned by exposure and not by the general climate of the district.

The subassociation *sub-irano-turanicum* occurs mainly on northern hillsides at kms. 23-26 of the Jerusalem-Jericho road. It is a more mesic unit than the subassociation *saharo-sindicum* and seems to be less conditioned by climate. It may be characterized by *Cotyledon intermedium* which at the same time constitutes within this district a characteristic species of the association as a whole.

A distinguishing characteristic between this and the Saharo-Sindian subassociation is the occurrence of a number of dwarf-shrubs, e.g., *Reaumuria palaestina, Salsola vermiculata* ssp. *villosa, Zygophyllum dumosum, etc.* The vernal associates are: *Poa Eigii* or a combination of some Saharo-Sindian species, (such as *Pteranthus dichotomus,, Gymnarrhena micrantha, Plantago ovata*), and some Irano-Turanian and Mediterranen species.

In the *Poosum*-facies many Mediterranean and Irano-Turanian species are met with; *Cotyledon* is a differential species; *Reboudia pinnata* is not abundant.

The subassociation *saharo-sindicum* is limited to a strip situated between kms. 30-33 of the above road. The borderline between this and the former subassociation may be drawn at about kms. 27-28 of the above road. This subassociation is found on very soft soil where Maestrichtian flint does not occur. Its characteristic species are *Leptaleum filiforme* and probably also *Koelpinia linearis*. It differs from the former subassociation by the scarcity of perennials,

by complete or almost complete lack of *Poa Eigii*, by the low coverage of *Aaronsohnia*.

Within the *Reboudiosum* facies, where *Reboudia* is a dominant in the vernal aspect, *Leptaleum filiforme*, which is a characteristic species of the whole subassociation, is at the same time a differential species for the other facies of this subassociation.

Within the facies of *Aaronsohniosum Faktorovskyi* *Aaronsohnia* is abundant and sometimes occurs together with *Plantago ovata*, while *Reboudia* is poorly represented. This facies seems to be confined to more compact soils.

The RECORD given here belongs to subassociation *sub-irano-turanicum Poosum*: Judean Desert: on the left side of the Jerusalem-Jericho road, opposite km. 23; alt. 170 m.; Maestrichtian hill; exp. W; sl. 45°; deep, friable, more or less stony soil with fine gravel on surface; ar. 100 m²; cov. 90-95%.

Suaeda asphaltica	3.3	*Koelpinia linearis*	+
Poa Eigii	5.4	*Linaria Haelava*	+
Plantago Coronopus	2.1	*Lithospermum temuiflorum*	+
Chenolea arabica	+	*Lagoseris obovata*	+
Herniaria hemistemon	+	*Matthiola longipetala*	+
Anagallis coerulea	1.1	*Onobrychis squarrosa*	+
Allium hierochuntinum	+	*Papaver Rhoeas*	+
Allium Erdelii	+	*Plantago notata*	+
Allium modestum	+	*Picris damascaena*	+
Anthemis maris-mortui	+	*Ranunculus asiaticus*	+
Aegilops Kotschyi	+	*Rumex roseus*	+
Astragalus callichrous	+	*Reaumuria palaestina*	+.2
Bromus fasciculatus	1.1	*Reboudia pinnata*	1.1
Calendula aegyptiaca	+	*Schismus arabicus*	1.1
Centaurea hyalolepis	+	*Senecio coronopifolius*	+
Ceratocephalus falcatus	+	*Silene apetala*	+
Chaetosciadium trichospermum	+	*Silene colorata*	+
Chrysanthemum coronarium	+	*Sisymbrium erysimoides*	+
Echium judaeum	+	*Spergula flaccida*	+
Euphorbia chamaepeplus	+	*Spergularia diandra*	1.1
Euphorbia latifolia	+	*Statice Thowini*	+
Erucaria Boveana	+	*Telmissa microcarpa*	+
Emex spinosus	+	*Trigonella arabica*	1.1
Filago prostrata	+	*Trigonella Schlumbergeri*	1.1
Helianthemum ledifolium	+	*Umbilicus intermedius*	+
Koeleria phleoides	+		

Here is a SAMPLE RECORD of subassociation *saharo-sindicum Reboudiosum*: Judean Desert: at km. 30 of the Jerusalem-Jericho road; Maestrichtian hill covered with grey, alluvial stoneless soil exp. E; sl. 20°; ar. 100 m²; cov. 100%.

Suaeda asphaltica	4.3	*Arnebia decumbens*	+
Reboudia pinnata	5.3	*Calendula persica*	+
Euphorbia chamaepeplus	2.1	*Cuscuta palaestina*	+
Leptaleum filiforme	2.1	*Filago prostrata*	+
Senecio coronopifolius	1.1	*Herniaria cinerea*	+
Plantago ovata	1.1	*Schismus arabicus*	+
Koelpinia linearis	+	*Spergularia diandra*	+
Astragalus tribuloides	+	*Trigonella arabica*	+

This plant association in its various forms has been recorded and observed by the author in many localities of the Judean Desert, e.g. mouth of Wadi Kelt; env. of Jebel Ekteif; env. of Nebi Musa; Khirbeth el Mird and along the lower part of the Jerusalem-Dead Sea road (at kms. 22-32) and between Wadi Dawaira and Wadi Shuqf (between Tekoa and Engedi).

(vii) Associations not yet definitely classed:

(38) *Atriplicetum palaestinae*

This association occurs under conditions of the Irano-Turanian-Saharo-Sindian border, and is mainly limited within the area of *Salsoletum villosae* and also of the *Noëetum mucronatae*. It does not display characteristic species of its own, but shows special combinations of the species. Frequent plants are: *Reaumuria palaestina, Salsola vermiculata* ssp. *villosa, Chenolea arabica,* etc. The vernal aspect is mainly made up of a *Poa Eigii* and *Reboudia pinnata. Plantago Coronopus* is also common.

SAMPLE RECORD: Judean Desert: hills near Khan Hatrur, at km. 18-19 on the Jerusalem-Jericho road; exp. SW; sl. 5-10°; rather soft, grey, steppe soil mixed with coarse gravel and stones on the surface, but scarcely stony within; ar. 100 m².

Atriplex palaestina	3.2	*Emex spinosus*	1.1
Reaumuria palaestina	1.1	*Aegilops Kotschyi*	+
Poa Eigii	3.3	*Carrichtera annua*	+
Anabasis articulata	+.2	*Centaurea hyalolepis*	+
Noea mucronata	+.2	*Minuartia picta*	+
Salsola vermiculata ssp. *villosa*	+.2	*Notoceras bicorne*	+
Plantago Coronopus	1.1	*Reseda decursiva*	+
Filago spathulata	1.1	*Schismus arabicus*	+
Evax contracta	1.1	*Silene apetala*	+
Elymus Delileanus	1.1	*Silene conica*	+
Erucaria Boveana	1.1	*Statice Thouini*	+
Spergularia diandra	1.1	*Stipa tortilis*	+
		etc.	

Also recorded from km. 20 and 23 on the above road (slopes of Wadi Fuar and border of Wadi Kelt).

(39) *Reaumurietum palaestinae* (EIG 1938)

This association is subdivided into:
(a) subassociation *typicum*,
(b) subassociation *Aaronsohnietosum*.

This association dominates in the Judean Desert on northern hillsides near Wadi Kelt and Wadi Fuar (in their middle and lower parts). The delimitation of this association both from the ecological and floristic point of view is very difficult. Frequent associates are *Noëa mucronata, Atriplex palaestinum, Salsola vermiculata* ssp. *villosa, Suaeda asphaltica, Echinops Blancheanus*. The Irano-Turanian character of this association is emphasized by the dominance of *Noëa mucronata*. Among the annuals *Poa Eigii* is the main associate. It is confined to the N exposure and to more or less deep soil (though stony or gravelly). It is represented in all records and is most abundant. *Reboudia pinnata* and *Plantago Coronopus* are also abundant.

The subassociation *Aaronsohnietosum* differs from the above by the composition of the vernal aspect.

The following is a RECORD of the subassociation *typicum;* Judean Desert: at km. 23 on the Jerusalem-Jericho road, descent of Wadi Kelt; exp. SSE; sl. 15-20°; compact soil mixed and covered with gravel; ar. 50m²; cov. 75%.

Reaumuria palaestina	2.3	*Anagallis coerulea*	+
Atriplex palaestinum	+.2	*Adonis dentata*	+
Poa Eigii	4.3	*Centaurea hyalolepis*	+
Aizoon hispanicum	2.1	*Echium judaeum*	+
Reseda decursiva	2.1	*Eniex spinosus*	+
Reboudia pinnata	2.1	*Elymus Delileanus*	+
Spergularia diandra	2.1	*Erodium deserti*	+
Trigonella stellata	2.1	*Hymenocarpus circinnatus*	+
Statice Thouini	1.1	*Linaria albifrons*	+
Filago prostrata	1.1	*Matthiola longipetala*	+
Herniaria cinerea	1.1	*Notoceras bicorne*	+
Crepis arabica	1.1	*Onobrychis squarrosa*	+
Gagea rigida	1.1	*Ononis sicula*	+
Pteranthus dichotomus	1.1	*Plantago Coronopus*	+
Medicago laciniata	1.1	*Plantago ovata*	+
Aaronsohnia Faktorovskyi	+	*Scorzonera papposa*	+
Astragalus callichrous	+	*Trigonella arabica*	+

Also recorded from kms. 21, 21.5, 23.5, 24 on the Jerusalem-Jericho road and on the slopes facing Wadi Fuar.

(40) *Halogetonetum alopecuroidis*

This association has not yet been adequately studied and its phytosociological delimitation remains uncertain.

SAMPLE RECORD: Judean Desert: at km. 25 of Jerusalem-Jeri-

cho road; exp. S; cl. 35° soil covered with Maestrichtian flint, boulders and coarse gravel; ar. 100 m²; cov. 70-80%.

Halogeton alopecuroides	2.2	*Gagea reticulata*	+
Salsola vermiculata ssp. *villosa*	2.2	*Hippocrepis unisiliquosa*	+
Anabasis articulata	2.2	*Hedypnois cretica*	+
Fagonia grandiflora	+.2	*Linaria Haelava*	+
Aaronsohnia Faktorovskyi	2.2	*Matthiola longipetala*	+
Statice Thouini	2.2	*Medicago laciniata*	+.
Pteranthus dichotomus	2.1	*Onobrychis squarrosa*	+
Plantago ovata	1.1	*Ononis sicula*	+
Astragalus callichrous	+	*Plantago Coronopus*	+
Astericus pygmaeus	+	*Rumex roseus*	+
Astragalus sp.	+	*Reseda decursiva*	+
Aegilops Kotschyi	+	*Reichardia tingitana*	+
Allium hierochuntinum	+	*Scabiosa palaestina*	+
Anthemis maris-mortui	+	*Scorzonera papposa*	+
Carthamus nitidus	+	*Stipa tortilis*	+
Calendula aegyptiaca	+	*Trigonella stellata*	+
Centaurea hyalolepis	+	*Trigonella Schlumbergeri*	+
Erucaria Boveana	+		

Also recorded from Wadi Ghar and Jebel Haj um Hemme (env. of W. Ghar); Transjordan: 70 and 178 km. S of Amman.

A doubtful unit. Part of the records should perhaps be referred to the *Chenoleion*.

D. Sudano-Deccanian associations

Order *Acacietalia* (EIG 1938)

The following associations are included in this order:
Acacietum tortilidis palaestinum
Association of *Zizyphus Spina-Christi-Moringa aptera*
Association of *Zizyphus Spina-Christi-Balanites aegyptiaca*.

(41) *Acacietum tortilidis palaestinum*, subdivided into the following subassociations: Pl. VII D

(a) *Anabasetosum articulati*,
(b) *Haloxylonetosum salicornici*,
(c) *Retametosum Roetami*.

The following RECORD presents the subassociation *Anabasetosum*:

Wadi 'Araba: 6 km. W of Ain Hasb; alt. +10m.; broad bed of wadi; soil densely covered with gravel; ar. 100m²; cov. 50%.

Acacia tortilis	2.3	*Lavandula pubescens*	+
Anabasis articulata	1.2	*Zilla spinosa*	+
Haloxylon salicornicum	1.2	*Salvia aegyptiaca*	+
Aerva tomentosa	1.2	*Linaria aegyptiaca*	+
Gymnocarpus fruticosus	+	*Tricholaena Teneriffae*	+
Daemia cordata	+	*Asphodelus tenuifolius*	1.1

Asteriscus graveolens	+	*Pulicaria undulata*	+
Antirrhinum Orontium	+	*Plantago ovata*	+
Echium angustifolium	+	*Reichardia tingitana*	+
Erodium deserti	+	*Reboudia pinnata*	+
Linaria Haelava	+	*Stipa barbata*	+
Pteranthus dichotomus	+		

The other two forms of this association have been recorded from 14 km. W of 'Aqaba and 1 km. N of Naqb 'Aqaba.

The subassociation *Anabasetosum* dominates the Saharo-Sindian territory of the Negev all along the hot wadis within their "région d'épandage". We have observed it around the Dead Sea, on the descent to 'Aqaba, on the ascent from 'Aqaba to Ras-en-Naqb and on the descent to Ain Hasb. Where the bed of the Wadi is sandy, this subassociation is replaced by the subassociation *Retametosum.*

(42) Association of *Zizyphus Spina-Christi-Moringa aptera*

SAMPLE RECORD: Dead Sea: env. of Engeddi; alt. —350 m.; debris of Cenomanian rocks on "Lisan Marl"; thick layer of grey crumbled soil containing fine and middle-sized gravel and stones; ar. 200m²; cov. 50-60%.

Zizyphus Spina-Christi	1.3	*Solanum incanum*	1.3
Moringa aptera	1.3	*Boerhavia plumbaginacea*	+.3
Acacia tortilis	2.3	*Lavandula coronopifolia*	+.2
Cordia Gharaf	1.3	*Withania somnifera*	+
Ochradenus baccatus	1.2	*Blepharis edulis*	+

Another record of this association has been taken in the same district near Kalirrhöe.

(43) Association of *Zizyphus Spina-Christi-Balanites aegyptiaca* Pl. VIII A

SAMPLE RECORD: Lower Jordan Valley, Ghor el Auja; alluvial soil; cov. 20%.

Zizyphus Spina Christi	2.3	*Plantago ovata*	+
Balanites aegyptiaca	1.2	*Spergularia diandra*	+
Solanum incanum	+	*Aizoon hispanicum*	+
Ephedra Alte	+	*Anthemis* sp.	+

This association is characteristic of the "région d'épandage" of wadis in the Lower Jordan Valley.

E. Litho-and chasmophytic associations

(44) *Varthemietum iphionoidis* (EIG 1938) Pl. VIII B

Habitat: exposed rock surfaces. This association is subdivided into two subassociations:

(a) *typicum,*

(b) *Stachydetosum palaestinae.*

SAMPLE RECORD of subassociation *typicum*: Samaria: env. of Sabastiya; hillside; exp. NE; sl. 30-40°; Senonian rocks; cov. 10-15%. Common on surface of rocks.

Varthemia iphionoides	+.2	*Andropogon hirtus*	+
Micromeria serpyllifolia	+.2	*Carthamus tenuis*	+
Dianthus multipunctatus	+.1	*Ononis leiosperma*	+
Phagnalon rupestre	+.2	(in soil pouches)	
Poterium spinosum (stunted specimen)	+.2		

SAMPLE RECORD of the subassociation *Stachydetosum*: Mt. Carmel, descent of Wadi Bestan; rocks within a thin *Pinetum*; ar. 10m²; cov. 25%.

Varthemia iphionoides	1.2	*Satureja Thymbra*	+.2
Stachys palaestina	1.2	*Andropogon hirtus*	+.2
Hypericum serpyllifolium	1.1	*Sedum* sp.	+.2
Fumana thymifolia	+.2		

Further records come from between Ramallah and Umm Safa; Sawiya (between Jerusalem and Nablus); E of Jenin; between Tayiba and Wadi Auja (descent of W. Habis).

(45) *Telmissetum microcarpae*

Characteristic habitat: Rock surface covered by a very thin layer of soil.

SAMPLE RECORD: Judean Mountains, env. of Motsa; rock surface.

Telmissa microcarpa	4.4	*Rhagadiolus stellatus*	+
Evax contracta	1.1	*Trigonella monspeliaca*	+
Poa bulbosa	+.2	*Erophila minima*	+
Anthemis pseudocotula	+		

(46) *Crepidetum hierosolymitanae*

Characteristic habitat: shady disintegrated rocks with chasms and pouches filled with soil.

SAMPLE RECORD: Judean Mountains, Motsa, exp. NNE; split Cenomanian rocks; accumulation of soil and gravel between rocks; cov. 70%.

Crepis hierosolymitana	3.2	*Scaligeria cretica*	+
Umbilicus intermedius	1.1	*Rubia Olivieri*	+
Cyclamen persicum	1.1	*Euphorbia thamnoides*	+
Dactylis glomerata	1.2	*Ranunculus asiaticus*	+
Micromeria nervosa	1.2	*Targionia hypophylla*	2.3

Further records have been taken from the env. of Deir esh Sheikh.

(47) Association of *Cheilanthes fragrans-Ceterach officinarum*

SAMPLE RECORD: Judean Mountains: Motsa, Dolomitic corroded rocks and boulders, mostly projecting from the ground; exp. SSE; the plants confined to crevices; area 2m²; cov. 15-20%.

Cheilanthes fragrans	1.2	*Erodium cicutarium*	+
Ceterach officinarum	1.2	*Vaillantia hispida*	+
Cynocrambe prostrata	1.2	*Nonnea obtusifolia*	+
Cyclamen persicum	+	*Lagoseris sancta*	+
Colchicum Steveni	1.1	*Allium subhirsutum*	+
Helianthemum salicifolium	+	*Allium stamineum*	+

(48) *Origanetum Dayi* Pl. VIII C

SAMPLE RECORD: This plant association has been found in the Negev, env. of Ras Zuweira; +630 m.; Maestrichtian rocks and stones; S exp.; sl. 15°; cov. 35%.

Origanum Dayi	3.2	*Poa Eigii*	1.1
Ballota undulata	1.2	*Carex pachystylis*	1.1
Centaurea eryngioides	+	*Daucus subsessilis*	1.1
Carlina corymbosa	+	*Plantago* sp.	+
Dianthus multipunctatus	+	*Nardurus orientalis*	+
Salvia lanigera	+	*Paronychia argentea*	+
Salsola vermiculata ssp. *villosa*	+	*Evax contracta*	+
Phagnalon rupestre	+	*Statice Thouini*	+
Echinops Blancheanus	+	*Carrichtera annua*	+
Noea mucronata	+	*Lactuca orientalis*	+

F. Psammophytic associations

The psammophytic associations of Palestine have been classed in two suborders: the *Retametalia arenaria palaestina* and the *Retametalia arenaria sinaica*. The former comprises the psammophytic associations of the Coastal Plain of Palestine, whereas the latter contains the associations of the light soils of the Isthmus of Sinai and the Negev.

The *Retametalia arenaria palaestina* comprises a series of associations grouped in three alliances: *Lotion creticae, Artemision monospermae palaestinum* and *Eragrostion bipinnatae*. They all have been subjected to a detailed synthetical study by the author and published in 1939. They are briefly mentioned here to render this review more nearly complete. For details on composition, habitat and geographic distribution the reader is referred to the original paper (EIG 1939).

The association of the *Retamion Roetami arenarium* and the *Haloxylonetum salicornici* occurring on desert sand and sand dunes may be tentatively referred to the *Retametalia arenaria sinaica*. Characteristic habitats are given here for each.

(i) *Lotion creticae*

This alliance comprises three associations confined to the Mediterranean shore and exposed to the action of waves during storms or at least to salt-water spray. These are:

(49) Association of *Sporobulus arenarius-Lotus creticus* best developed on the elevated, generally steep sandy shore.

(50) Association of *Helianthemum ellipticum-Lotus creticus*, limited to the edge of the high sandy clay shore, more or less covered by calcareous concretions of Kurkar.

(51) Association of *Ipomoea littoralis-Salsola Kali*, characteristic of wadi outlets which cut the high shore and empty on to the beach; it occurs outside the regular tide but within the limits of waves during storms.

(ii) *Artemision monospermae* (*palaestinum*)

The associations of this alliance are confined to drifting or semi-stabilized dunes or to valleys between dunes with deep sandy substratum. The associations are as follows:

(52) Association of *Ammophila arundinacea-Cyperus conglomeratus*, occurring on high drifting dunes without any traces of humus.

(53) Association of *Lithospermum callosum-Scrophularia hypericifolia*, occurring in moist valleys between dunes, or sometimes on deep, sandy fields.

(54) Association of *Artemisia monosperma-Cyperus mucronatus*, occurring in semi-drifting, generally low dunes or more rarely deep, wavy sand fields.

(55) Association of *Atractylis flava-Crucianella maritima*, occurring in more or less loose sandy clay, or more often, pure, deep sand or somewhat wavy sandfields, in the vicinity of the sea but beyond the direct action of storm and of salt-water drops.

(iii) *Eragrostion bipinnatae* (*palaestinum*)

The associations of this alliance are confined to Kurkar hills (calcareous sandy concretions of old dunes) especially on southern and eastern slopes, and on their weathering products: sandy and sandy-clay soils.

(56) *Helianthemetum elliptici*, occurring on Kurkar hills.

(57) Association of *Ononis stenophylla-Convolvulus secundus*, occurring on sandy soil produced by the weathering of Kurkar hills and accumulating at the foot or in the lower part of the slopes of these hills.

(58) Association of *Eragrostis bipinnata-Centaurea procurrens*, occurring on more or less undulating plains and valleys of red sandy-clay soils, poor in or destitute of calcium.

(59) *Ormenidetum mixtae*, occurs in the same habitats as the *Eragrostis-Centaurea* association and precedes the latter in the successional sere.

(iv) *Retamion Roetami arenarium*

This alliance comprises three associations:

Association of *Artemisia monosperma-Retama Roetam*

Association of *Retama Roetam-Anabasis articulata*

Retametum Roetami of wadis

Among the species common to all the three above associations are *Retama Roetam, Aristida lanata, Atractylis flava,* etc.

(60) Association of *Artemisia monosperma-Retama Roetam*.

This association is rather closely related to the *Retama-Anabasis* association. The main differences between it and the latter are: in the *Artemisia-Retama* association the number of annuals, particularely of psammophytic annuals, is small; *Lycium europeum* is present; *Artemisia monosperma* is dominant; and non-psammophytic perennials are scarce. In general this association is well developed on dunes N and S of El Arish (Coastal Plain of Negev).

SAMPLE RECORD: Negev: env. of Asluj (S of Beersheba); sand dunes; cov. 10%.

Artemisia monosperma	1.2	*Atractylis flava*	+
Retama Roetam	+	*Aristida lanata*	+
Lycium europaeum (?)	+	*Echiochilon fruticosum*	+
Citrullus Colocynthis	+	*Plantago albicans*	+
Scabiosa eremophila	+	*Bassia eriophora*	+

Also recorded from 15 km. N. of Asluj.

(61) Association of *Retama Roetam-Anabasis articulata*. This is subdivided into:

(a) *Thymelaeetosum hirsutae*

(b) *Calligonetosum comosi*

The subassociation *Thymelaeetosum* differs from the *Calligonetosum*, among others, by the presence of *Thymelaea* and *Artemisia Herba-alba*, the greater number of non-psammophytic perennials and the absence of *Calligonum*. This is due to the fact that the subassociation *Thymelaeetosum* is confined to deep sands and not to elevated dunes.

The following RECORD is taken from the *Thymelaeetosum* subassociation: Negev: env. of Kurnub; plain; Nubian-sand soil; ar. 100m²; cov. 50%.

Retama Roetam	2.3	*Artemisia Herba-alba*	+
Anabasis articulata	2.3	*Aristida ciliata*	+
Thymelaea hirsuta	3.3	*Aristida lanata*	+.2
Argyrolobium uniflorum	2.1	*Aristida obtusa*	+
Plantago albicans	2.1	*Stipa Lagascae*	+
Asphodelus microcarpus	1.2	*Atractylis flava*	+
Onopordon alexandrinum	+	*Salvia lanigera*	+

Noea mucronata	+	*Lotus villosus*	+
Aegilops bicornis	+	*Matthiola livida*	+
Adonis dentata	+	*Onomis serrata* (?)	+
Centaurea sinaica	+	*Picris* sp.	+
Crucianella membranacea	+	*Polycarpon succulentum*	+
Erodium pulverulentum	+	*Schimpera arabica*	+
Euphorbia sp.	+	*Silene setacea*	+
Ifloga spicata	+		

Records have also been taken from other localities of the same district and from the Tureibe plain.

(62) *Retametum Roetami* Pl. VIII D

This association is confined to sandy beds of wadis under the climatic conditions of the Negev. Floristically it is very different from the other two associations of the *Retamion Roetami arenarium.*

SAMPLE RECORD: Southern Negev: 38 km. from Kusseima on the way to Beersheba; a broad wadi bed, sandy-loess soil; ar. 100m².

Retama Roetam	1.3	*Noea mucronata*	+.3
Thymelaea hirsuta	+.3	*Haloxylon articulatum*	+.3
Artemisia monosperma	+.3	*Asphodelus tenuifolius*	+
Lycium europaeum (?)	+.3		

Also found on the Kurnub Plain.

(v) Associations not yet definitely classed:

(63) *Haloxylonetum salicornici* and its subassociation *Haloxylonetosum persici.* Pl. IX A

SAMPLE RECORD: Edom, Wadi Ithm, 88 km. S of Ma'an; plain between granite mountains, more or less loose sandy soil with scattered gravel, on surface; cov. 30-40%.

Haloxylon salicornicum	2.3	*Caylussea canescens*	+.2
Artemisia judaica	2.3	*Peganum Harmala*	+
Retama Roetam	2.3	*Citrullus Colocynthis*	+
Acacia tortilis	+.3	*Notoceras bicorne*	+
Zilla spinosa	1.3	*Robbairea prostata*	+
Artemisia Herba-alba	+.2	*Schismus barbatus*	+

Other records of this type have been taken from the junction of Wadi Ithm and Wadi 'Araba, and from the kms. 14 and 31 on the 'Aqaba-Kusseima road.

The subassociation *Haloxylonetosum persici* was found in Edom, 79 km. S of Maan in Wadi el Madifen and near the mouth of Wadi 'Araba (4 km. W of 'Aqaba). The following is a RECORD taken from Edom: 79 km. S of Ma'an, Wadi el Madifen at the foot of granite mountains, coarse sand; ar. 100m²; cov. 15%.

Haloxylon persicum	2.3	*Helianthemum ellipticum*	+
Haloxylon salicornicum	2.3	*Echiochilon fruticosum*	+
Retama Roetam	1.3	*Aristida ciliata*	+
Zilla spinosa	1.3		

G. *Hydrophytic associations*

(i) *Populion euphraticae* (Eig 1938)

The association of this alliance are confined to non-saline or nearly non-saline Lisan Marl layers along the lower and middle course of the Jordan River. Its climatic conditions are Saharo-Sindian or transitional between Saharo-Sindian, Irano-Turanian and Mediterranean.

The following three riparian associations have been distinguished:

(64) *Populetum euphraticae*

This association occurs on the banks of the Jordan River where the soil is apparently inundated in spring. It is also found in tributary wadis in the vicinity of the Jordan subjected to periodical inundation.

Sample record: Lower Jordan Valley: near the Allenby Bridge, banks of the Jordan River.

Populus euphratica	5.4	*Caucalis tenella*	+
Tamarix jordanis	1.3	*Cynodon dactylon*	+
Lycium barbarum (?)	2.3	*Chenopodium murale*	+
Prosopis farcata	2.2	*Lactuca Scariola*	+
Capparis spinosa var.	+.2	*Malva parviflora*	+
Asparagus palaestinus	+.1	*Sinapis arvensis*	+
Glycyrrhiza glabra	1.1	*Scorpiurus subvillosus*	+
Atriplex Halimus	+	*Sonchus oleraceus*	+
Convolvulus siculus	+	*Solanum nigrum*	+
Erucaria Boveana	+	*Trifolium formosum*	+

(65) *Tamaricetum jordanis*

The ecological relations between this association and the *Populetum* are not clear. The former seems to be confined to more elevated banks not subjected to regular seasonal inundation. The soil seems, therefore, to be more saline here than in the *Populetum*.

Sample record: Lower Jordan Valley: banks of the Jordan River, near Jisr ed Damie; ar. 200m²; cov. 95%.

Tamarix jordanis	3.3	*Malva parviflora*	1.1
Lycium barbarum (?)	1.2	*Anagallis coerulea*	+
Prosopis farcata	2.3	*Anthemis* sp.	+
Asparagus palaestinus	1.2	*Beta vulgaris*	+
Glycyrrhiza glabra	2.2	*Bromus scoparius*	+
Atriplex Halimus	3.3	*Bromus* sp.	+
Cynanchum acutum	1.1	*Capsella bursa-pastoris*	+

Centaurea hyalolepis	+	*Papaver Rhoeas*	+
Chenopodium murale	+	*Phalaris minor*	+
Cistanche tubulosa	+	*Polycarpon tetraphyllum*	+
Crepis aspera	+	*Polygonum equisetiforme*	+
Cynodon dactylon	+	*Rumex dentatus*	+
Cyperus rotundus	+	*Schanginia baccata*	+
Erodium malacoides	+	*Senecio vernalis*	+
Eruca sativa	+	*Sinapis arvensis*	+
Euphorbia Peplus	+	*Sisymbrium Irio*	+
Galium Aparine	+	*Spergularia marginata*	+
Hordeum murinum	+	*Trigonella arabica*	+
Lamarckia aurea	+	*Urospermum picroides*	+
Lolium rigidum	+	*Urtica pilulifera*	+
Mercurialis annua	+		

(66) Association of *Prosopis farcata-Glycyrrhiza glabra*

This association seems to be confined to a belt behind the *Populetum* where the soil is still inundated annually or nearly so. It is, however, situated at a certain distance from the Jordan, where the *Populetum* fails to develop.

SAMPLE RECORD: Banks of the Jordan near the Allenby Bridge; soil moist up to a depth of about 10 cm.; periodically inundated; outer belt of the gallery forest; cov. 90%.

Prosopis farcata	5.3	*Spergularia marginata*	+
Glycyrrhiza glabra	2.2	*Rumex dentatus*	+
Imperata cylindrica	2.2	*Senecio vernalis*	+
Cyperus rotundus	3.2	*Cichorium pumilum*	+
Cynodon dactylon	1.2	*Ricinus communis*	+
Coronopus procumbens	1.1	*Heleochloa schoenoides*	+
Chenopodium murale	+	*Emex spinosus*	+

(ii) Associations of other alliances:

(67) *Platanetum orientalis*

SAMPLE RECORD: Upper Jordan Valley; env. of Hamam; between Mishmar Hayarden and Tabigha; banks of Jordan River; cov. 100%.

Platanus orientalis	4.3	*Vitis vinifera*	2.3
Salix acmophylla (?)	3.4	*Ficus carica*	1.3
Arundo Donax	3.3	*Asparagus aphyllus*	+.2
Rubus sanctus	3.3	*Nerium Oleander*	+
Vitex Agnus-Castus	1.2		

(68) Association of *Cyperus Papyrus-Polygonum acuminatum* Pl. IX B

SAMPLE RECORD: Huleh swamps: 50 m. N of Jordan outlet into the Lake of Merom; cov. 100%.

Cyperus Papyrus	4.4	*Cynanchum acutum*	+
Polygonum acuminatum	+	*Lycopus europaeus*	+
Dryopteris Thelypteris	1.1		

(69) *Phragmitetum communis*

Records of this association have been taken from a few localities and its composition is as yet inadequately studied.

(70) Association of *Inula viscosa-Juncus acutus*

SAMPLE RECORD: Sharon Plain: between Wadi Falik and Nathania; swamp on light soil; ar. 100m²; cov. 100%.

Inula viscosa	2.2	*Carex* sp.	+.2
Juncus acutus	2.2	*Teucrium scordioides*	1.2
Rubus sanctus	2.2	*Festuca arundinacea*	+
Trifolium fragiferum	3.4	*Ononis leiosperma*	+
Panicum repens	3.4	*Ambrosia maritima*	+
Pulicaria dysenterica	1.2	*Trixago apula*	+

(71) *Viticetum Agni-Casti*

SAMPLE RECORD: Samaria: on the Jerusalem-Nablus road; env. of Lubban Valley, banks of a wadi.

Vitex Agnus-Castus	2.3	*Ononis leiosperma*	1.2
Inula viscosa	1.2	*Poterium spinosum*	+
Tolpis virgata	1.1		

(72) *Equisetetum ramosissimi*

SAMPLE RECORD: Coastal Plain: between Tel-Aviv and Petah-Tiqva (Wadi Musrara), elevated bank; deep hardened stoneless alluvial soil; ar. 25m²; cov. 90%.

Equisetum ramosissimum	4.4	*Artedia squammata*	+
Cyperus longus	1.2	*Erigeron crispum*	+
Inula viscosa	1.3	*Lolium rigidum*	+
Rubus sanctus	1.3	*Phalaris brachystachys*	+
Cynodon dactylon	1.2	*Polygonum equisetiforme*	+
Lippia nodiflora	1.2	*Ranunculus muricatus*	+
Panicum repens	1.2	*Senecio arvensis*	+
Oxalis cernua	+		

(73) Association of *Juncus maritimus-Schoenus nigricans*

SAMPLE RECORD: Acre Plain: sand dunes opposite Kiryath-Avoda; deep through between hills; ar. 50m²; cov. 70-80%.

Juncus maritimus	1.2	*Oenothera Drummondi*	1.2
Schoenus nigricans	3.2	*Verbascum galileum*	+.1
Imperata cylindrica	1.2	*Retama Roetam*	+.3
Erianthus Ravennae	+.2	*Artemisia monosperma*	1.2
Inula viscosa	+.2	*Lotus creticus*	+.2
Lippia nodiflora	1.2	*Lotus tenuifolius*	+.2

Polygonum equisetiforme	+.2	*Melilotus indicus*	+
Trifolium lappaceum	1.1	*Senecio joppensis*	1.1
Trifolium campestre	1.1	*Pholiurus filiformis*	1.1

(74) Association of *Crypsis minuartioides-Heliotropium supinum*

SAMPLE RECORD: Coastal Plain: env. of Ra'anana; a dried up swamp of nazaz (pan) formed on sandy-clay soil; surface crust cracked and split into large crumbs.

Crypsis minuartioides	4.4	*Crozophora plicata*	1.2
Heliotropium supinum	1.2		

H. Halophytic associations

(i) *Suaedion palaestinae* (EIG 1938)

This alliance is confined to Saharo-Sindian conditions of the Lower Jordan Valley and to deep, gravelless Lisan Marl soil, very saline and more or less moist during the whole year. It comprises a series of associations, of which only two are mentioned here:

(75) *Suaedetum palaestinae* (EIG 1938), subdivided into the following subassociations:

(a) *typicum,*
(b) *Staticetosum Limonii,*
(c) *Prosopidetosum farcatae.*

The typical subassociation develops on the higher terrace of the Jericho Plain, whereas the subassociation *Prosopidetosum* is confined to the lower terrace of this plain, situated below the belt of "broken land". The degree of salinity of the surface layer is considerably lower than in the next subassociation. This is also obvious from the presence of *Salsola vermiculata* ssp. *villosa, Salsola tetrandra,* etc. Among the characteristic perennials *Salsola Rosmarinus* is most constant.

The subassociation *Prosopidetosum* is limited to soils highly saline on surface, but in the deeper layers, where the roots of *Prosopis* (and probably also of *Alhagi Maurorum* and *Atriplex Halimus*) penetrate, the salinity of the soil decreases. *Prosopis* seems to possess the deepest roots, reaching an altogether non-saline soil horizon.

The high salinity of the surface soil accounts for the almost entire absence of annuals. The most frequent annual of this subassociation is *Tetradiclis salsa.*

The following RECORD is taken from the typical form: Lower Jordan Valley: Jericho Plain, reddish-brown, compact stoneless soil; ar. 100m²; cov. 30%.

Suaeda palaestina	2.2	*Salsola tetrandra*	1.3
Salsola Rosmarinus	1.3	*Atriplex Halimus*	+.3

Statice pruinosa	+.3	*Erucaria Boveana*	+
Salsola vermiculata ssp. *villosa*	+.2	*Malva parviflora*	+
Mesembryanthemum nodiflorum	1.1	*Plantago notata*	+
Astragalus hamosus	+	*Plantago Lagopus*	+
Aaronsohnia Faktorovskyi	+	*Plantago ovata*	+
Asphodelus tenuifolius var. *micranthus*	+	*Pteranthus dichotomus*	+
		Reboudia pinnata	+
Aizoon hispanicum	+.1	*Spergularia diandra*	+
Amberboa crupinoides	+	*Schismus arabicus*	+.1
Beta vulgaris	+	*Sphaenopus divaricatus*	+
Calendula aegyptiaca	+	*Trigonella stellata*	+
Centaurea hyalolepis	+	*Torularia torulosa*	+
Chenopodium murale	+	*Tetradiclis salsa*	+
Diplotaxis erucoides	+		

Many records of the typical and other subassociations, all taken from the Jericho-Dead Sea region are available.

(76) Association of *Suaeda palaestina-Suaeda fruticosa*

This association occurs in the vicinity of the Dead Sea shores where the soil is very saline.

SAMPLE RECORD: Env. of the Dead Sea shore; alluvial loess soil; ar. 100m²; cov. 50%.

Suaeda fruticosa	2.3	*Suaeda monoica*	+.3
Suaeda palaestina	1.3		

The association of (77) *Nitraria retusa-Suaeda palaestina;* (78) *Atriplex Halimus-Suaeda fruticosa;* (79) *Atriplex Halimus-Salsola villosa* are fragmentary and it is doubtful whether they should be referred to the *Suaedion palaestinae.* To the same group belong *Arthrocnemum glaucum-Nitraria retusa; Atriplex Halimus-Suaeda fruticosa; Atriplex Halimus-Salsola vermiculata* ssp. *villosa* and *Salsoletum foetidae.* Nearly all of them are confined to the salines of the Dead Sea region and the Lower Jordan Valley[1].

(ii) *Salsolion tetrandrae* (EIG 1938)

(80) *Salsoletum tetrandrae,* subdivided into the following subassociations: Pl. IX C

(a) *typicum,*

(b) *Mesembryanthemetosum Forskahlei.*

This is a well defined plant association, occupying vast stretches of Lisan Marl formation (including the belt of "broken land") in the Lower Jordan Valley. Except for some geophytes, no other perennial associates occur. This characteristic is also peculiar to

[1] The vegetation of this saline region is most intricate. There is a belting arrangement of most plant communities and the delimitation of the phytosociological units requires extensive records. (Ed.).

some associations of the *Anabasidion articulati* and the *Salsolion villosae*, limited to the Jordan Valley. In the vicinity of Jericho, however, and particularly near the hillsides of the Judean Desert the perennial *Suaeda asphaltica* sometimes occurs in *Salsoletum tetrandrae*. The floristic composition of the vernal aspect varies according to topography (slight depressions affecting soil moisture) and to human influence (accumulation of nitrates). Among the annuals *Filago spathulata* var. *prostrata* may be considered a leading plant, while *Stipa tortilis, Trigonella stellata, Crepis arabica*, etc. are probably plants very frequently met with. *Gagea rigida* and *Erythrostictus palaestina* are frequent geophytes.

The subassociation *Mesembryanthemetosum* is found on highly gypseous soil on the "tables" of broken land. The presence of (more or less) succulent plants in this subassociation such as *Mesembryanthemum Forskahlei, M. nodiflorum, Aizoon hispanicum, Spergularia diandra* and *Bassia eriophora*, is rather characteristic.

Sample record of subassociation *typicum*: Dead Sea Plain: opposite km. 34 on the Jerusalem-Kallia road; grey steppe soil mostly covered with the lichen *Diploschistes scruposus* and gravel; ar. 100 m^2; cov. 80%.

Salsola tetrandra	2.3	*Crepis arabica*	+.
Suaeda asphaltica	1.2	*Centaurea hyalolepis*	+
Filago prostata	3.2	*Erodium deserti*	+
Stipa tortilis	1.1	*Malva parviflora*	+
Mesembryanthemum nodiflorum	1.1	*Reseda decursiva*	+
Plantago ovata	1.1	*Reboudia pinnata*	+
Plantago Coronopus	1.1	*Senecio coronopifolius*	+
Reboudia pinnata	1.1	*Salsola inermis*	+
Astragalus callichrous	1.1	*Statice Thouini*	+
Anthemis maris-mortui	+	*Spergularia marginata*	+
Aizoon hispanicum	+	*Spergularia diandra*	+
Aaronsohnia Faktorovskyi	+	*Trigonella stellata*	1.2
Allium hierochuntinum	+		

All records of this association have been taken from the Dead Sea region and the Jericho Plain.

(81) Association of *Salsola tetrandra-Halogeton alopecuroides*

Sample record: Transjordan: 148 km. S of Amman (6 km. S of Hasa); soft limestone hills; exp. W; sl. 15°; grey compact soil mixed with stones and gravel; cov. 5%.

Salsola tetrandra	1.2	*Plantago ovata*	+
Halogeton alopecuroides	+.2	*Stipa tortilis*	+
Poa sinaica	+.2	*Pteranthus dichotomus*	+
Erodium hirtum	+	*Schismus arabicus*	+

(iii) Associations of uncertain phytosociological relationship:

(82) *Nitrarietum retusae*

Ths association occurs in the Saharo-Sindian territories near springs or marshes on not very saline soils.

SAMPLE RECORD: Wadi 'Araba; Ain Hasb; brown soil; cov. 60%.

Nitraria retusa	3.4	*Atriplex Halimus*	+.3
Juncus maritimus var. *arabicus*	2.3	*Asphodelus tenuifolius*	+
Phragmites communis	+.2	*Frankenia pulverulenta*	+
Zygophyllum dumosum	1.2	*Reichardia tingitana*	+

Also observed in Transjordan near Qasr el 'Azraq.

(83) *Atriplicetum Halimi* Pl. IX D

This association occurs in dry wadi beds of the Saharo-Sindian territory. The number of halophytes is less than in the *Atriplex Halimus-Salsola villosa* association, as the salts of the soil are here leached out by water running in winter through the wadis.

SAMPLE RECORD: Judean Desert: env. of Nebi Musa; bed of a wadi; soft soil; ar. 100m²; cov. 95%.

Atriplex Halimus	3.2	*Hymenocarpus circinnatus*	1.1
Salsola vermiculata ssp. *villosa*	1.2	*Calendula aegyptiaca*	+
Chrysanthemum coronarium	3.2	*Convolvulus siculus*	+
Pimpinella cretica	1.1	*Echium judaeum*	+
Hordeum murinum	2.1	*Faktorovskya Aschersoniana*	+
Phalaris minor	1.1	*Hordeum ithaburense*	+
Lamarckia aurea	1.1	*Matthiola aspera*	+
Reboudia pinnata	1.1	*Koeleria phleoides*	+
Anthemis pseudocotula (?)	1.1	*Statice Thouini*	+

Records have also been taken from Khirbeth el Mird and surroundings; plain, opposite and near km. 26 and 36 on the Jerusalem-Kallia road.

(84) *Arthrocnemetum glauci*

The following is a typical RECORD of this association from the Sharon, env. of Athlit: saline soil within salt lagune area; inundated plain, grey, stoneless, cracked soil; surface covered with a thin crust of lichens; ar. 100 m²; cov. 60-70%.

Arthrocnemum glaucum	3.4	*Centaurium* sp.	+
Plantago crassifolia	2.1	*Hordeum maritimum*	+
Sphaenopus divaricatus	2.1	*Lolium rigidum*	+
Pholiurus filiformis	2.1	*Lepturus incurvatus*	+
Spergularia rubra	1.1	*Medicago ciliaris*	+
Juncus buffonius	2.1	*Medicago hispida*	+
Chlamydophora tridentata	1.2	*Polypogon maritimum*	+
Anthemis pseudocotula ssp. *rotata*	+		

(85) *Phragmitetum communis (salinum)*

SAMPLE RECORD: Athlit: saline soils; cov. 100%.

Phragmites communis	5.5	*Polygonum monspeliacum*	1.1
Hordeum maritimum	1.1		

I. Segetal associations

(86) Association of *Carthamus tenuis-Ononis leiosperma*

SAMPLE RECORD[1]: Judean Mountains: Mt. Scopus; alt. 820 m.; exp. W; white calcareous soft soil, wheat field; ar. 100 m²; cov. (of weeds) 30%.

Carthamus tenuis (leaf rosettes)	1.1	*Lepidium Draba*	1.1
Ononis leiosperma	1.2	*Medicago hispida*	+
Astoma seselifolium	2.1	*Malcolmia crenulata*	+
Hirschfeldia incana	1.1	*Matthiola longipetala*	+
Aristolochia Maurorum	1.1	*Ornithogalum* sp.	+
Anthemis pseudocotula	+	*Phalaris brachystachys*	+
Bellevalia flexuosa	+	*Phalaris nodosa*	+
Cerastium viscosum	+	*Papaver Argemone*	+
Convolvulus arvensis	+	*Papaver Rhoeas*	+
Eryngium creticum	+	*Ridolfia segetum*	+
Galium tricorne	+	*Specularia pentagonia*	+
Gladiolus atroviolaceus	+	*Sinapis arvensis*	+
Lolium temulentum	+	*Silene longipetala*	+
Linum mucronatum	+	*Vaccaria segetalis*	1.1
Linum pubescens	+	*Vogelia apiculata*	+

Other records have been taken at kms. 8 and 10 on the Jerusalem-Tel-Aviv road; env. of Shu'fat; betw. Kefar Ivri and Ataroth; Wadi Haramiya (between Ramalla and Nablus); Valley of Lubban.

(87) *Prosopidetum farcatae*

This association comprises several units not yet adequately differentiated, e.g. association of *Prosopis farcata-Scolymus maculatus;* association of *Prosopis farcata-Alhagi Maurorum;* association of *Prosopis farcata-Cynara syriaca.*

SAMPLE RECORD: Plain of Shephela: env. of Beer Tuvia; fallow field, black greyish soil; ar. 100 m²; cov. 90%.

Prosopis farcata	2.2	*Cynodon dactylon*	1.2
Cynara syriaca	1.2	*Trifolium lappaceum*	1.2
Pulicaria arabica	1.1	*Lygia passerina*	1.1
Scolymus maculatus	1.1	*Euphorbia falcata*	1.1
Daucus aureus	1.1	*Aegilops speltoides*	+
Filago spathulata	1.1	*Astericus aquaticus*	+
Convolvulus pentapetaloides	1.1	*Ammi Visnaga*	+

[1] This plant list has been chosen from the editor's lists as it represents the most typical composition of this association.

Anchusa italica	+	*Koeleria phleoides*	+
Astragalus hamosus	+	*Lachnophyllum hierosolymitanum*	+
Carlina lanata	+	*Lagoseris sancta*	+
Cichorium pumilum	+	*Lavatera trimestris*	+
Centaurea Verutum	+	*Molucella laevis*	+
Convolvulus hirsutus	+.2	*Medicago hispida*	+
Crepis aspera	+	*Salvia pinnata*	+
Gundelia Tournefortii	+	*Trifolium tomentosum*	+
Onosma auriculatum	+	*Teucrium spinosum*	+
Haplophyllum Buxbaumii	+	*Urospermum picroides*	+

Records have also been taken from the following localities: Sharon Plain: between Sheikh Muwannis and Herzlia; Wadi Hawaith; env. of Nathania; Shephela Plain: env. of Beer Tuvia and Gan Yavne; env. of el-Qubab (E of Ramleh); Lower Galilee: bet-Nahalal and Sheikh Bureiq; Kishon Plain: env. of Yagur.

(88) *Malvetum aegyptiae*

SAMPLE RECORD: Negev: env. of Beersheba, near Wadi Madsus; alt. 305 m.; plain; ar. 100 m²; cov. 50%.

Malva aegyptia	4.2	*Filago prostrata*	+
Schismus arabicus	1.1	*Torularia torulosa*	+
Adonis dentata	+	*Astragalus palaestinus*	+
Achillea Santolina	+		

(89) *Achilleetum Santolinae*

SAMPLE RECORD: Negev: Plain of Beersheba, at km. 71 on the Jerusalem-Beersheba road; grey steppe soil, barley field; cov. (of weeds) 10-15%.

Achillea Santolina	1.2	*Cynodon dactylon*	+
Astragalus Feinbruniae	1.2	*Erucaria Boveana*	+
Alkanna strigosa	+	*Euphorbia falcata*	+
Heliotropium rotundifolium	+	*Filago spathulata* var. *prostrata*	+
Astragalus beersheebensis	+	*Herniaria hirsuta*	+
Gypsophila Rokejeka	+	*Hippocrepis unisiliquosa*	+
Convolvulus Dorycnium	+	*Hymenocarpus circinnatus*	+
Pithuranthus tortuosus	+	*Isatis aleppica*	+
Gundelia Tournefortii	+	*Onobrychis crista-galli*	+
Anagallis coerulea	2.1	*Papaver* sp.	+
Plantago albicans	1.2	*Phalaris paradoxa*	+
Anthemis pseudocotula ssp. *rotata*	+	*Pterocephalus involucratus*	+
Avena sterilis	+	*Senecio coronopifolius*	+
Bupleurum nodiflorum	+	*Scorpiurus subvillosus*	+
Caucalis tenella	+	*Tordylium aegyptiacum*	+
Chaetosciadium trichospermum	+	*Trifolium tomentosum*	+
Centaurea hyalolepis	+		

Records have also been taken from the environs of Qurnub on loess soil.

VEGETATIONAL TRANSECTS

General explanations

Figures under curved broken line indicate approximate altitude above or below S. L. in m. Figures above the same line indicate distances in kms.; the starting point being O. Letters above upper horizontal line indicate segments into which the transects have been subdivided. The limits of the segments, especially when indicated by a broken line are approximate only. Dominating plant communities are generally represented by larger type; local and rarer plant communities by smaller type. The abbreviations used are explained for each transect.

Not always have official roads been followed in transects; therefore the distances between localities as marked in the transects may in some cases considerably differ from those in official maps.

TRANSECT 1. BEERSHEBA — KURNUB — AIN HASB

a — cultivated area; b — assoc. of *Anabasis Haussknechtii — Plantago Coronopus;* c — assoc. of *Artemisia Herba alba — Asphodelus microcarpus;* d — *Zygophylletum dumosi* (on hills and stony depressions), associations of *Anabasidion articulati* (in depressions); e — *Acacietum tortilidis Anabasidetosum* in wadis and depressions), hills and plateaux are plantes or nearly so, rarely bestrewn with patches of *Gymnocarpetum fruticosi.* At Ain Hasb — *Nitrarietum retusae.*

TRANSECT 2. BEERSHEBA — ZUWEIRA — DEAD SEA

a — associations of *Artemision Herbae albae;* b — *Salsoletum villosae* (in a and b the assoc. of *Anabasis Haussknechtii — Plantago Coronopus* occur in depressions); c — associations of *Artemision Herbae albae;* d — *Salsoletum villosae;* e — *Chenoleetum arabicae Helianthemetosum;* f — probably *Zygophylletum dumosi.*

TRANSECT 3. HEBRON — BENI NAIM — ENGEDDI

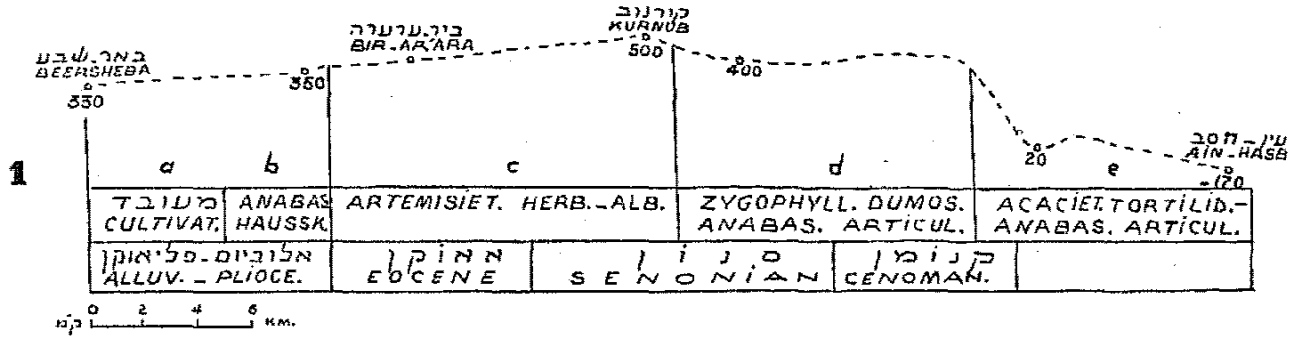
a —*Poterietum spinosi* (*orientale*); b — *Poterietum spinosi* (*orientale*); *Phlomidetum brachyodontis;* c — *Artemisietum Herbae albae;* d — *Gymnocarpetum fruticosi,* associations of *Anabasidion articulatae, Chenoleetum arabicae, Suaedetum asphalticae;* e — *Zygophylletum dumosi* (locally also *Suaedetum asphalticae* and *Gymnocarpetum fruticosi*).

TRANSECT 4. BETLEHEM — WADI NUSRANIYEH

a — *Poterietum spinosi;* b — *Phlomidetum brachyodontis,* locally *Poterietum* and *Noëetum;* c — *Salvietum graveolentis; Artemisietum Herbae albae,* locally *Retama Duriaei;* e — *Noëtum mucronatae* (?) and *Artemisietum Herbae albae;* f — *Noëetum mucronatae,* locally *Salvietum graveolentis;* g — *Salsoletum villosae;* h — *Suaedetum asphalticae, Chenoleetum arabicae, Salsoletum villosae.*

TRANSECT 5. JERUSALEM — JORDAN RIVER

a — *Ononidetum Natricis* dominating; locally: *Noëetum mucronatae, Artemisietum Herbae albae; Echinopetum Blancheani, Poterietum spinosi* (*orientale*), *Thymetum capitati* (*orientale*); b — *Artemisietum Herbae albae* dominating locally: *Echinopetum Blancheani, Noëetum mucronatae, Ononidetum Natricis,*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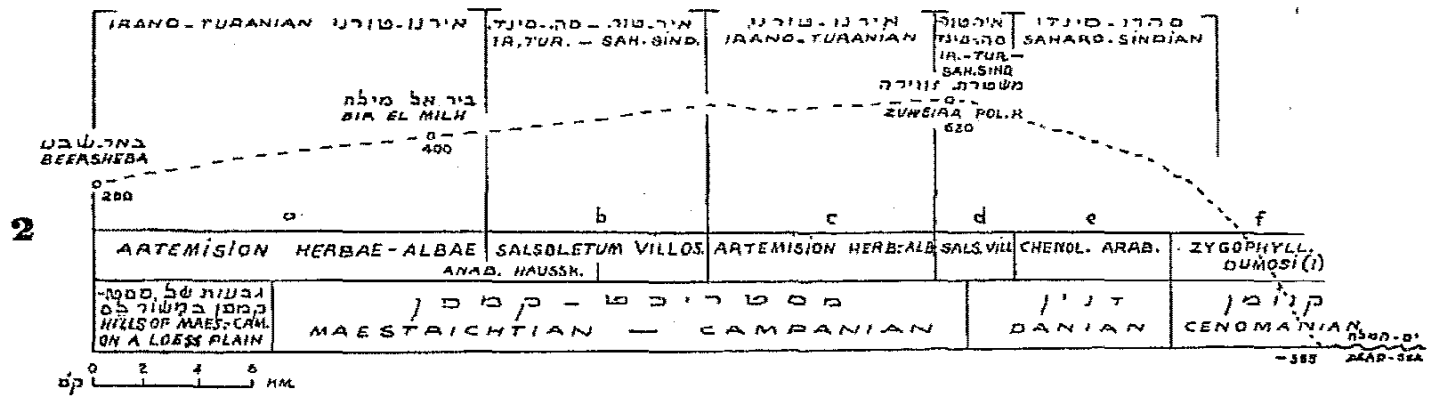
BEERSHEBA
BIR-AR'ARA
KURNUB
AIN-HASB
a
b
c
d
e
CULTIVAT.
ANABAS. HAUSSK.
ARTEMISIET. HERB.-ALB.
ZYGOPHYLL. DUMOS. ANABAS. ARTICUL.
ACACIET. TORTILID.-ANABAS. ARTICUL.
ALLUV.-PLIOCE.
EOCENE
SENONIAN
CENOMAN.
KM.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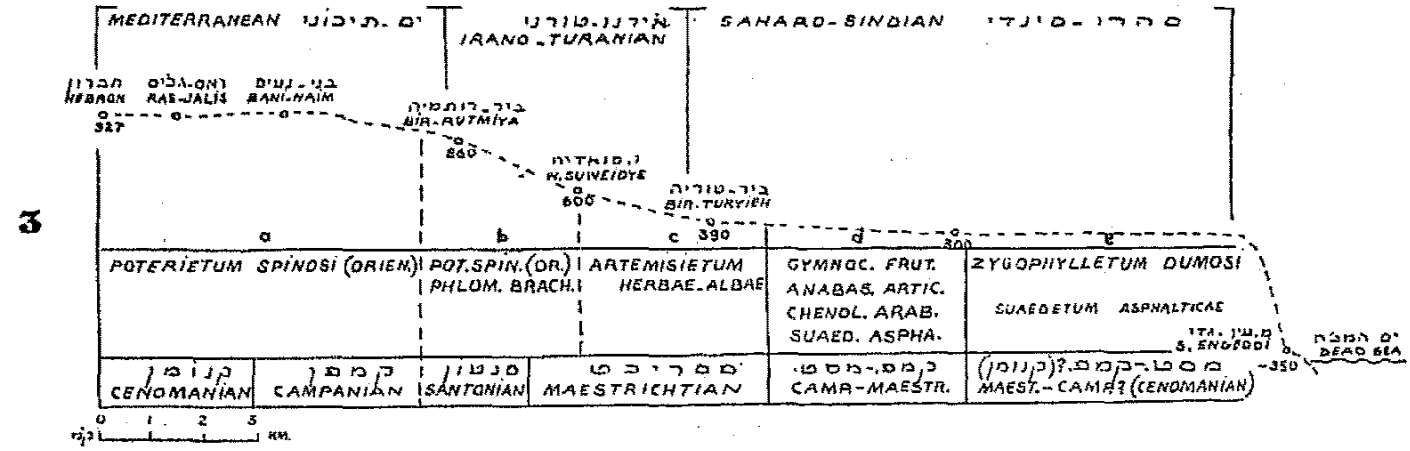
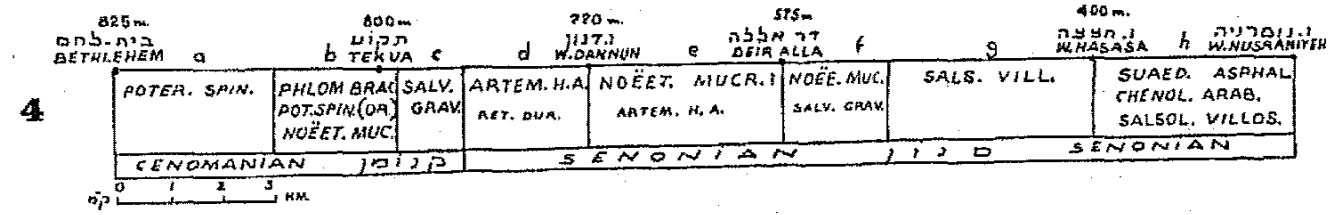
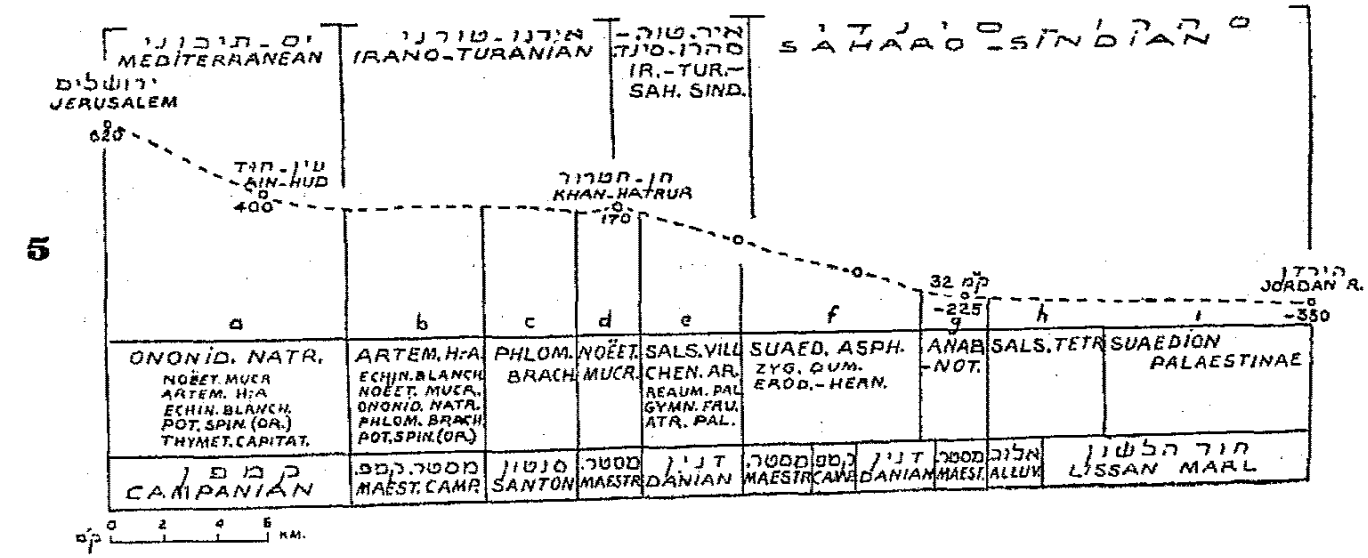
IR.-TUR.-SAH.-SIND.
SAHARO-SINDIAN
BEERSHEBA
BIR EL MILH
ZUWEIRA
a
b
c
d
e
f
ARTEMISION HERBAE-ALBAE
SALSOLETUM VILLOS. ANAB. HAUSSK.
ARTEMISION HERB.-ALB.
SALS. VILL.
CHENOL. ARAB.
ZYGOPHYLL. DUMOSI (I)
HILLS OF MAES.-CAM. ON A LOESS PLAIN
MAESTRICHTIAN — CAMPANIAN
DANIAN
CENOMANIAN
DEAD SEA
KM.


3
MEDITERRANEAN
IRANO-TURANIAN
SAHARO-SINDIAN
HEBRON
BIR-RUTMIYA
W. SUWEIDYE
BIR-TURYIEH
S. ENGEDDI
DEAD SEA
a
b
c
d
e
POTERIETUM SPINOSI (ORIEN.)
POT. SPIN. (OR.) PHLOM. BRACH.
ARTEMISIETUM HERBAE-ALBAE
GYMNOC. FRUT. ANABAS. ARTIC. CHENOL. ARAB. SUAED. ASPHA.
ZYGOPHYLLETUM DUMOSI
SUAEDETUM ASPHALTICAE
CENOMANIAN
CAMPANIAN
SANTONIAN
MAESTRICHTIAN
CAMP.-MAESTR.
MAEST.-CAMP.? (CENOMANIAN)
KM.


4
BETHLEHEM
TEKUA
W. DANNUN
DEIR ALLA
W. HASASA
W. NUSRANIYEH
a
b
c
d
e
f
g
h
POTER. SPIN.
PHLOM. BRAC. POT. SPIN. (OR.) NOËET. MUC.
SALV. GRAV.
ARTEM. H. A.
RET. DUR.
NOËET. MUCR. I
ARTEM. H. A.
NOËE. MUC.
SALV. GRAV.
SALS. VILL.
SUAED. ASPHAL. CHENOL. ARAB. SALSOL. VILLOS.
CENOMANIAN
SENONIAN
KM.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MEDITERRANEAN
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IR.-TUR.-SAH. SIND.
SAHARO-SINDIAN
JERUSALEM
AIN-HUD
KHAN-HATRUR
JORDAN R.
a
b
c
d
e
f
g
h
i
ONONID. NATR. NOËET. MUCR. ARTEM. H:A ECHIN. BLANCH. POT. SPIN. (OR.) THYMET. CAPITAT.
ARTEM. H:A ECHIN. BLANCH. NOËET. MUCR. ONONID. NATR. PHLOM. BRACH. POT. SPIN. (OR.)
PHLOM. BRACH.
NOËET. MUCR.
SALS. VILL. CHEN. AR. REAUM. PAL. GYMN. FRU. ATR. PAL.
SUAED. ASPH. ZYG. DUM. EROD.-HEAN.
ANAB. -NOT.
SALS. TETR.
SUAEDION PALAESTINAE
CAMPANIAN
MAEST. CAMP.
SANTON.
MAESTR.
DANIAN
MAESTR.
CAMP.
DANIAN
MAESTR.
ALLUV.
LISSAN MARL
KM.

Phlomidetum brachyodontis, Poterietum spinosi (orientale); c — *Phlomidetum brachyodontis*; d — *Noëetum mucronatae*; e — *Salsoletum villosae* on N and W slopes, *Chenoleetum arabicae* on S and E slopes; locally: *Reaumurietum palaestinae, Gymnocarpetum fruticosi, Atriplicetum palaestinae*; f — *Suaedetum asphalticae* dominating; on rocky places: *Zygophylletum dumosi*; locally: assoc. of *Erodium glaucophyllum — Herniaria hemistemon*; g — assoc. of *Anabasis articulata — Notoceras bicorne*; h — *Salsoletum tetrandrae*; i — associations of *Suaedion palaestinae*.

TRANSECT 6. QUSRA — JORDAN RIVER

a — *Poterietum spinosi (mediterraneum)*; b — *Poterietum spinosi (orientale)*; locally *Calcycotometum villosae*; c — *Echinopetum Blancheani*; d — associations of *Retamo-Phlomion brachyodontis*: locally *Calycotometum villosae*; e — *Salsoletum villosae*; f — uncertain; g — *Salsoletum villosae*; h — *Salsoletum villosae and Atriplicetum Halimi*; i — *Atriplicetum Halimi*; j — assoc. of *Suaeda palaestina — Suaeda fruticosa*, assoc. of *Salsola villosa — Stipa tortilis*; k — *Populetum euphraticae* and *Tamaricetum jordanis*.

TRANSECT 7. AIN YABRUD — JORDAN RIVER

a — *Poterietum spinosi (mediterraneum)*; b — *Poterietum spinosi (orientale)*; c — associations of *Retamo-Phlomion brachyodontis*; d — mainly *Salsoletum villosae* and assoc. of *Salsola villosa — Stipa tortilis*; locally *Suaedetum asphalticae* and stands of *Salsola lancifolia*; e — *Atriplicetum Halimi*.

TRANSECT 8. TUBAS — JORDAN RIVER

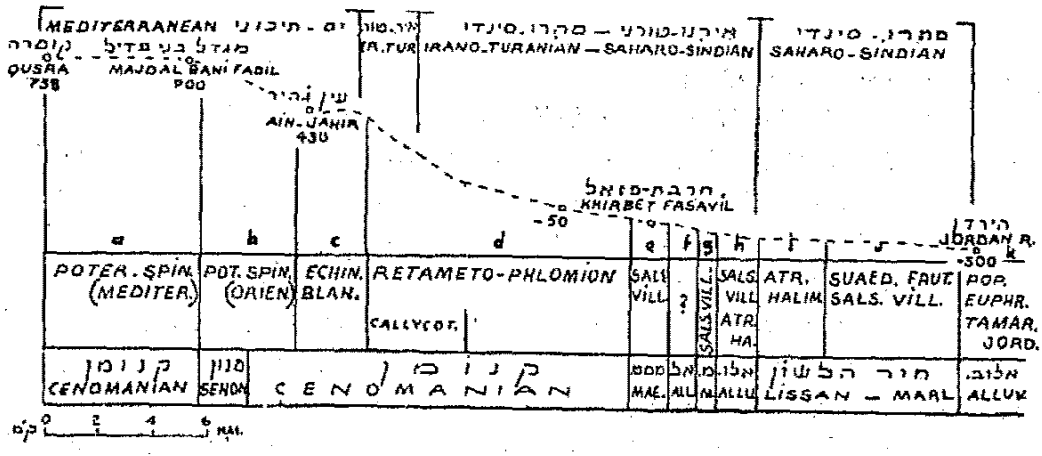
a — assoc. of *Ceratonia Siliqua — Pistacia Lentiscus*; b — associations of *Retamo-Phlomion brachyodontis*; c — assoc. of *Salsola villosa — Stipa tortilis* on Lisan Marl.

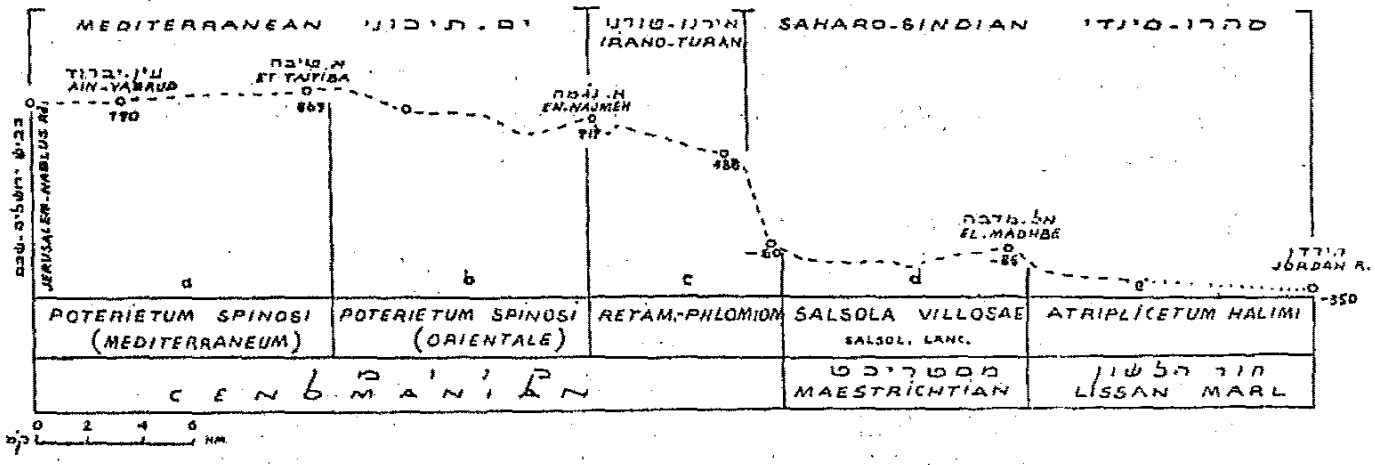
TRANSECT 9. JORDAN RIVER — AMMAN

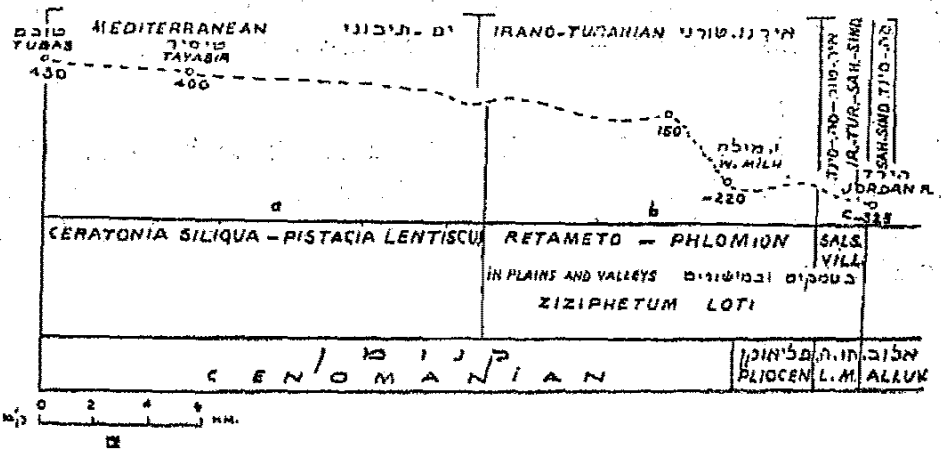
a — *Populetum euphraticae, Tamaricetum jordanis* and stands of *Zizyphus spina-Christi*; b — *Salsoletum tetrandrae*; c — assoc. of *Salsola villosa — Stipa tortilis, Atriplicetum Halimi* with scattered trees of *Balanites aegyptiaca*; d — assoc. of *Zizyphus spina-Christi — Balanites aegyptiaca*; e — assoc. of *Retama Duriaei — Rhus oxyacanthoides* (dominating on mountains); stands of *Zizyphus spina-Christi* (on upper terrace of Wadi Nimrin), *Arundetum Donacis* (on lower terrace of the above wadi); locally on Lisan Marl: assoc. of *Anabasis articulata — Notoceras bicorne* (?); f — assoc. of *Quercus calliprinos — Pistacia palaestina* partly devastated and replaced by *Poterietum spinosi (mediterraneum)*; farther east, patches of *Phlomidetum orientale*.

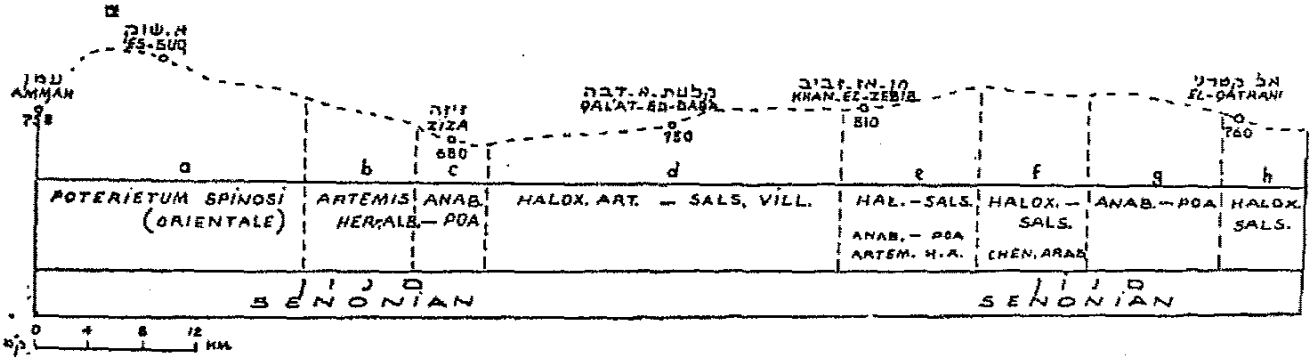
TRANSECT 10. AMMAN — EL QATRANI

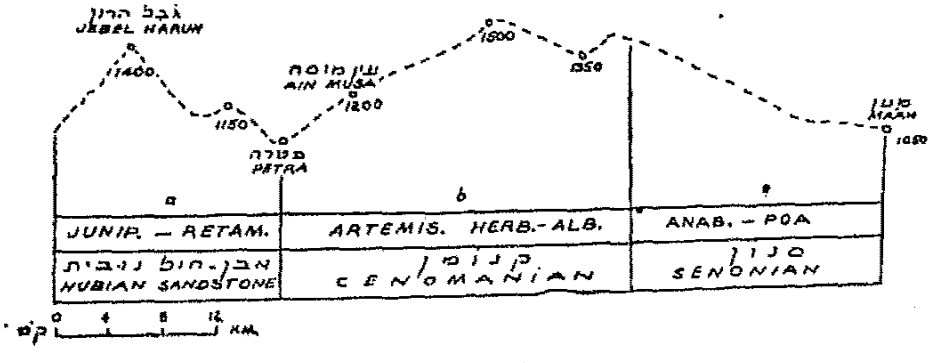
a — *Poterietum spinosi (orientale)*, locally patches of *Euphorbia macroclada*; b — associations of *Artemision Herbae albae*; c — assoc. of Anabasis *Haussknechtii — Poa sinaica*; d — assoc. of *Haloxylon articulatum — Salsola villosa*; e — assoc. of *Anabasis Haussknechtii-Poa sinaica*; assoc. of *Haloxylon articulatum — Salsola villosa* and *Artemisietum Herbae-albae*; f — assoc. of *Haloxylon articulatum — Salsola villosa*; in depressions also *Chenoleetum arabicae* and *Halogetonetum alopecuroidis*; g — assoc. of *Anabasis Haussknechtii — Poa sinaica*; h — assoc. of *Haloxylon articulatum — Salsola villosa*.


6
MEDITERRANEAN
IRANO-TURANIAN — SAHARO-SINDIAN
SAHARO-SINDIAN
QUSRA 738
MAJDAL BANI FADIL P60
AIN-JAHIR 430
KHIRBET FASAVIL -50
JORDAN R. -300
POTER. SPIN. (MEDITER.)
POT. SPIN. (ORIEN.)
ECHIN. BLAN.
RETAMETO-PHLOMION
CALLYCOT.
SALS. VILL.
SALS. VILL. ATR. HA.
ATR. HALIM.
SUAED. FRUT. SALS. VILL.
POP. EUPHR. TAMAR. JORD.
CENOMANIAN
SENON.
CENOMANIAN
MAE.
ALL.
LISSAN — MARL
ALLUV.
0 2 4 6 KM.


7
MEDITERRANEAN
IRANO-TURAN
SAHARO-SINDIAN
AIN-YABRUD 790
ET TAYIBA 683
EN.NAUMEH 717
480
EL.MADHBE -85
JORDAN R. -350
JERUSALEM-NABLUS Rd.
POTERIETUM SPINOSI (MEDITERRANEUM)
POTERIETUM SPINOSI (ORIENTALE)
RETAM.-PHLOMION
SALSOLA VILLOSAE
SALSOL. LANC.
ATRIPLICETUM HALIMI
CENOMANIAN
MAESTRICHTIAN
LISSAN MARL
0 2 4 6 KM.


8
MEDITERRANEAN
IRANO-TURANIAN
TUBAS 430
TAYASIR 400
150
W. MILH
JORDAN R. -328
CERATONIA SILIQUA — PISTACIA LENTISCUS
RETAMETO — PHLOMION
IN PLAINS AND VALLEYS
ZIZIPHETUM LOTI
SALS. VILL.
CENOMANIAN
PLIOCEN
L.M.
ALLUV.
0 2 4 6 KM.


10
AMMAN 738
ZIZA 680
750
KHAN-EZ-ZEBIB 810
EL-QATRANI 760
POTERIETUM SPINOSI (ORIENTALE)
ARTEMIS HERB.-ALB. — POA
ANAB.
HALOX. ART. — SALS. VILL.
HAL. — SALS.
ANAB. — POA
ARTEM. H.A.
HALOX. — SALS.
CHEN. ARAB.
ANAB. — POA
HALOX. SALS.
SENONIAN
SENONIAN
0 4 8 12 KM.


13
JEBEL HARUN 1460
1150
PETRA
AIN MUSA 1200
1500
850
AMMAN 1050
JUNIP. — RETAM.
ARTEMIS. HERB.-ALB.
ANAB. — POA
NUBIAN SANDSTONE
CENOMANIAN
SENONIAN
0 4 8 16 KM.

TRANSECT 11. EL QATRANI — MA'AN

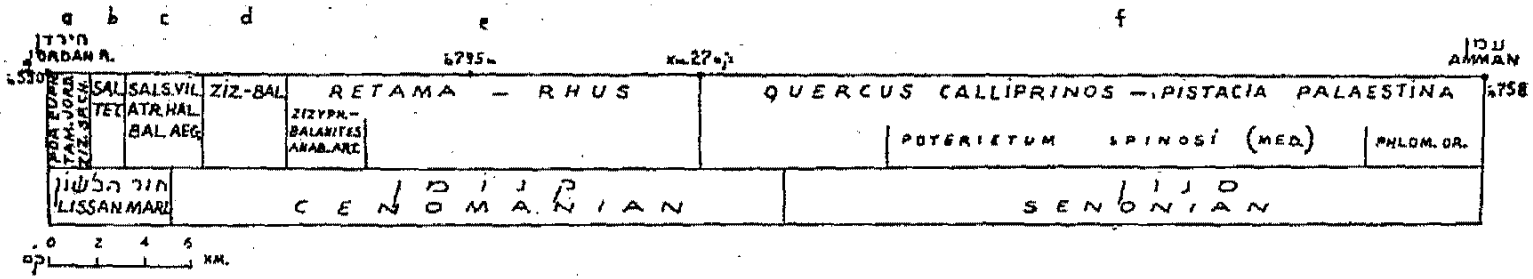
a — assoc. of *Anabasis Haussknechtii — Poa sinaica;* b — assoc. of *Anabasis Haussknechtii — Poa sinaica* generally with very low coverage but denser in depressions; *Artemisietum Herbae-albae;* locally *Salsoletum tetrandrae;* on hillsides *Chenoleetum arabicae;* c — assoc. of *Anabasis Haussknechtii — Poa sinaica;* d — *Salsoletum tetrandrae* with *Anabasis Haussknechtii;* e — assoc. of *Anabasis Haussknechtii — Poa sinaica,* in depressions also *Artemisietum Herbae-albae* and locally also *Salsoletum tetrandrae;* f — *Halogeton alopecuroides* together with *Salsola tetrandra; Artemisietum Herbae-albae* in depressions; g — assoc. of *Anabasis Haussknechtii — Poa sinaica* and *Artemisietum Herbae-albae;* h — *Artemisietum Herbae-albae;* i — *Salsoletum tetrandrae,* in depressions mainly *Artemisietum Herbae-albae;* j — mainly assoc. of *Anabasis Haussknechtii — Poa sinaica,* locally in depressions *Artemisietum Herbae-albae.*

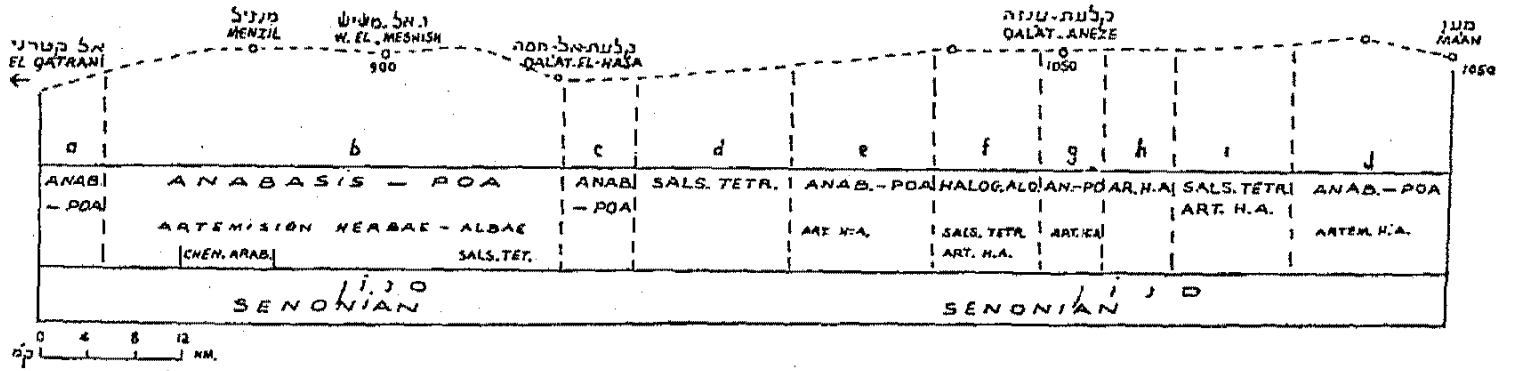
TRANSECT 12. MA'AN — AQABA

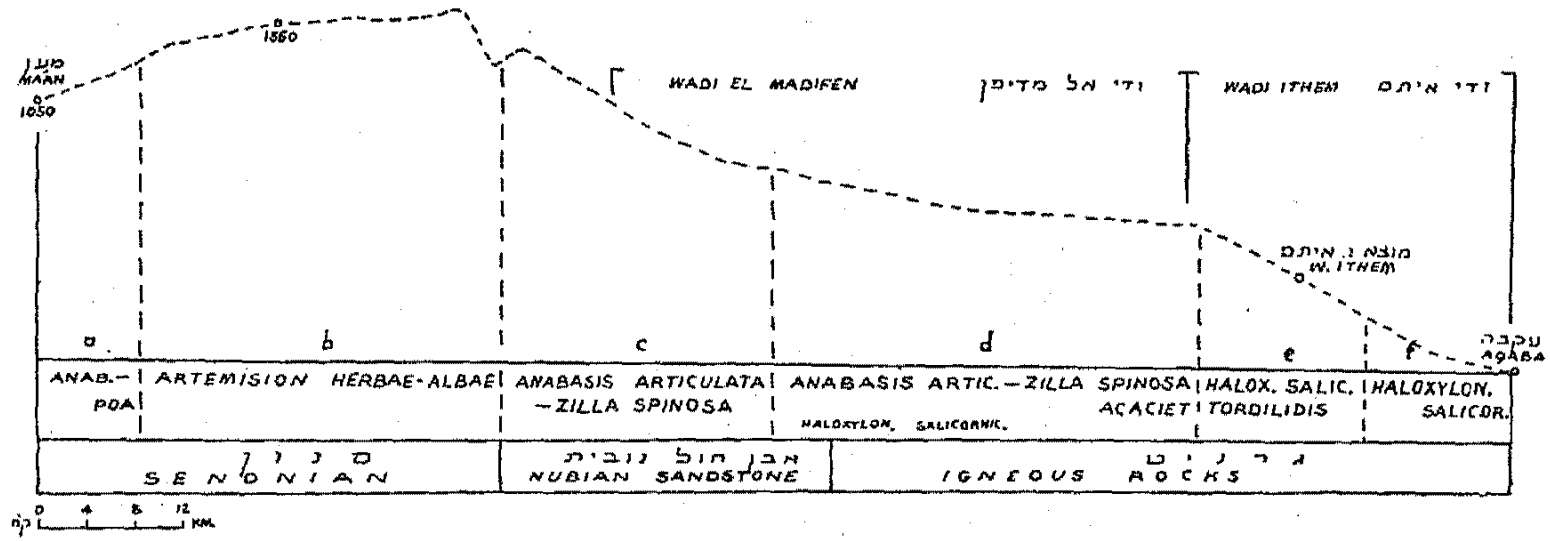
a — assoc. of *Anabasis Haussknechtii — Poa sinaica;* b — assoc. of *Artemision Herbae-albae* (incl. assoc. of *Artemisia Herba-alba — Rheum palaestinum*); c — assoc. of *Anabasis articulata — Zilla spinosa* (with *Noëa mucronata* as codominant); d — assoc. of *Anabasis articulata — Zilla spinosa* (typical) in Wadi Madifen, *Haloxylonetum salicornici* incl. subassociation *Haloxylonetosum persici;* in the outlets of tributary wadis into Wadi Madifen and Wadi Ithm: *Acacietum tortilidis;* f — *Haloxylonetum salicornici.*

TRANSECT 13. PETRA — MA'AN

a — *Juniperetum phoeniceae* together with *Retama Roetam;* b — associations of *Artemision Herbae-albae,* locally *Prunus prostrata, Crataegus Azarolus* (in wadis) *Ononidetum Natricis* and allied associations; c — assoc. of *Anabasis Haussknechtii — Poa sinaica.*


9
a b c d e f
JORDAN R.
AMMAN
QUERCUS CALLIPRINOS — PISTACIA PALAESTINA
RETAMA — RHUS
POTERIETUM SPINOSI (MED.)
PHLOM. OR.
ZIZ.-BAL.
SALS.VIL. ATR.HAL. BAL.AEG.
ZIZYPH.-BALANITES ANAB.ART.
LISSAN MARL
CENOMANIAN
SENONIAN
0 2 4 6 KM.


11
EL QATRANI
MENZIL
W. EL MESHISH
QALAT EL HASA
QALAT ANEZE
MAAN
a b c d e f g h i j
ANAB. — POA
ANABASIS — POA
ARTEMISION HERBAE-ALBAE
CHEN. ARAB.
SALS. TET.
SALS. TETR.
HALOG. ALO.
AN.-PO.
AR. H.A.
SALS. TETR. ART. H.A.
ANAB. — POA
ARTEM. H.A.
SENONIAN
SENONIAN
0 4 8 12 KM.


12
MAAN
1650
1560
WADI EL MADIFEN
WADI ITHEM
W. ITHEM
AGABA
a b c d e f
ANAB. — POA
ARTEMISION HERBAE-ALBAE
ANABASIS ARTICULATA — ZILLA SPINOSA
ANABASIS ARTIC. — ZILLA SPINOSA ACACIET
HALOXYLON, SALICORNIC.
HALOX. SALIC. TORDILIDIS
HALOXYLON. SALICOR.
SENONIAN
NUBIAN SANDSTONE
IGNEOUS ROCKS
0 4 8 12 KM.

MAP OF DISTRIBUTION OF PLANT COMMUNITIES

Explanations

The number marked on the map represent localities where phytosociological records have been taken by the author. Very often one number represents records of several adjacent associations which technically could not be separately represented. The associations of the light soil belt and *Quercetum ithaburensis* published by the author (E i g, 1939) are not represented in this map.

1. Association of Pinus halepensis - Hypericum serpyllifolium; association of Cistus villosus - Cistus salvifolius. **2**. Association of Pinus halepensis - Hypericum serpyllifolium; association of Ceratonia Siliqua - Pistacia Lentiscus; association of Quercus calliprinos - Pistacia palaestina; Varthemietum iphionoidis. **3**. Association of Pinus halepensis - Hypericum serpyllifolium. **4**. Association of Pinus halepensis - Hypericum serpyllifolium; association of Quercus calliprinos - Pistacia palaestina. **5 - 7**. Association of Quercus calliprinos - Pistacia palaestina. **8**. Association of Quercus calliprinos - Pistacia palaestina; association of Cistus villosus - Cistus salvifolius; Crepidetum hierosolymitani. **9**. Association of Quercus calliprinos - Pistacia palaestina. **10**. Association of Quercus calliprinos - Pistacia palaestina; Poterietum spinosi (mediterraneum). **11 - 12**. Association of Ceratonia Siliqua - Pistacia Lentiscus. **13**. Association of Ceratonia Siliqua - Pistacia Lentiscus; Arthrocnemetum glauci; Phragmitetum communis (salinum). **14**. Association of Cistus villosus - Cistus salvifolius; association of Pinus halepensis - Hypericum serpyllifolium. **15**. Association of Cistus villosus - Cistus salvifolius; Varthemietum iphionoidis; association of Pinus halepensis - Hypericum serpyllifolium. **16**. Association of Cistus villosus - Cistus salvifolius. **17**. Calycotometum villosae. **18**. Poterietum spinosi (mediterraneum). **19**. Poterietum spinosi (mediterraneum); Prosopidetum farcatae. **20**. Poterietum spinosi (mediterraneum). **21-22**. Poterietum spinosi (mediterraneum); Varthemietum iphionoidis. **23 - 27**. Poterietum spinosi (mediterraneum). **28**. Poterietum spinosi (mediterraneum); association of Carthamus tenuis - Ononis leiosperma. **29-32**. Poterietum spinosi (mediterraneum). **33**. Poterietum spinosi (mediterraneum); Prosopidetum farcatae. **34**. Poterietum spinosi (mediterraneum). **35**. Poterietum spinosi (orientale). **36**. Poterietum spinosi (orientale); association of Noea mucronata - Ononis Natrix; Ononidetum Natricis; association of Carthamus tenuis - Ononis leiosperma. **37**. Poterietum spinosi (orientale); Artemisietum Herbae-albae deserti judaici; Phlomidetum brachyodontis typicum. **38-39**. Poterietum spinosi (orientale). **40**. Poterietum spinosi (orientale); Chenoleetum arabicae; Artemisietum Herbae-albae deserti judaici. **41**. Poterietum spinosi (orientale); Halogetonetum alopecuroidis; Phlomidetum brachyodontis typicum; association of Phlomis brachyodon - Blepharis edulis. **42**. Poterietum spinosi (orientale); Phlomidetum brachyodontis typicum; Ononidetum Natricis; association of Noea mucronata - Ononis Natrix; Varthemietum iphionoidis. **43**. Poterietum spinosi (orientale); association of Phlomis brachyodon - Blepharis edulis. **44**. Poterietum spinosi (orientale); Echinopetum Blancheani. **45**. Thymetum capitati; Ononidetum Natricis; Phlomidetum brachyodontis typicum. **46**. Salvietum graveolentis; Phlomidetum brachyodontis typicum; Achilleetum santolinae. **47**. Association of Poterium spinosum-Thymelaea hirsuta. **48**. Echinopetum Blancheani; Artemisietum Herbae-albae

deserti judaici; association of Retama Roetam - Rhus oxyacanthoides; Salsoletum villosae. **49**. Echinopetum Blancheani. **50**. Echinopetum Blancheani; Atriplicetum palaestinae; association of Erodium glaucophyllum - Herniaria hemistemon; Gymnocarpetum fruticosi; Noeetum mucronatae; association of Salsola villosa - Stipa tortilis; Salsoletum villosae; association of Salsola villosa - Gymnocarpus fruticosus. **51**. Ononidetum Natricis. **52**. Artemisietum Herbae-albae deserti judaici; association of Noea mucronata - Ononis Natrix. **53**. Artemisietum Herbae-albae deserti judaici; association of Erodium glaucophyllum - Herniaria hemistemon; association of Chenolea arabica - Salsola villosa; Atriplicetum Halimi. **54 - 55**. Artemisietum Herbae-albae deserti judaici. **56**. Association of Artemisia Herba-alba - Asphodelus microcarpus; association of Anabasis articulata - Zilla spinosa; Zygophylletum dumosi; association of Retama Roetam-Anabasis articulata. **57 - 58**. Association of Artemisia Herba-alba - Asphodelus microcarpus. **59**. Association of Artemisia Herba-alba - Asphodelus microcarpus; Origanetum Dayi; association of Salsola villosa - Gymnocarpus fruticosus. **60 - 61**. Association of Artemisia Herba-alba - Asphodelus microcarpus. **62**. Association of Artemisia Herba-alba - Asphodelus microcarpus; Achilleetum santolinae; association of Retama Roetam - Anabasis articulata; Retametum Roetami. **63**. Association of Haloxylon articulatum - Salsola villosa; association of Anabasis Haussknechtii - Poa sinaica. **64 - 67**. Association of Haloxylon articulatum - Salsola villosa. **68 -69**. Association of Anabasis Haussknechtii - Poa sinaica. **70**. Association of Anabasis Haussknechtii - Poa sinaica; Halogetonetum alopecuroidis. **71**. Association of Anabasis Haussknechtii - Poa sinaica. **72**. Noeetum mucronatae; association of Erodium glaucophyllum - Herniaria hemistemon. **73**. Noeetum mucronatae. **74**. Association of Noea mucronata-Ononis Natrix; Phlomidetum brachyodontis typicum; Salsoletum villosae; Chenoleetum arabicae. **75**. Association of Noea mucronata - Ononis Natrix; Suaedetum asphalticae; Atriplicetum Halimi. **76**. Phlomidetum brachyodontis typicum. **77**. Association of Phlomis brachyodon - Blepharis edulis. **78**. Association of Retama Duriaei - Blepharis edulis; association of Salsola villosa - Gymnocarpus fruticosus. **79 - 80**. Association of Retama Duriaei - Blepharis edulis. **81**. Association of Retama Duriaei - Blepharis edulis; association of Salsola villosa - Gymnocarpus fruticosus. **82**. Association of Salsola villosa - Stipa tortilis; association of Zizyphus Spina Christi - Balanites aegyptiaca. **83**. Association of Salsola villosa - Stipa tortilis. **84**. Association of Salsola villosa - Stipa tortilis; association of Anabasis articulata - Notoceras bicorne; Salsolion tetrandrae. **85 - 86**. Association of Salsola villosa - Stipa tortilis. **87**. Association of Salsola villosa - Stipa tortilis; association of Salsola villosa - Gymnocarpus fruticosus; Chenoleetum arabicae; Suaedetum asphalticae; Reaumurietum palaestinae; Halogetonetum alopecuroidis. **88**. Salsoletum villosae; Suaedetum asphalticae. **89 - 90**. Salsoletum villosae. **91**. Salsoletum villosae; association of Salsola villosa - Gymnocarpus fruticosus. **92**. Association of Salsola villosa - Gymnocarpus fruticosus; association of Chenolea arabica - Salsola villosa. **93**. Association of Salsola villosa - Gymnocarpus fruticosus; Chenoleetum arabicae; association of Chenolea arabica - Salsola villosa. **94**. Association of Anabasis Haussknechtii - Plantago Coronopus. **95**. Association of Anabasis Haussknechtii - Plantago Coronopus; Malvetum aegyptiae. **95a**. Association of Anabasis Haussknechtii - Plantago Coronopus. **96**. Zygophylletum

dumosi. **97.** Zygophylletum dumosi; Gymnocarpetum fruticosi; Chenoleetum arabicae. **98.** Zygophylletum dumosi; association of Artemisia monosperma - Retama Roetam. **99 - 100.** Zygophylletum dumosi. **101.** Gymnocarpetum fruticosi; association of Chenolea arabica - Salsola villosa; association of Zizyphus Spina-Christi - Moringa aptera. **102 - 104.** Association of Gymnocarpus fruticosus - Zilla spinosa. **105.** Association of Erodium glaucophyllum - Herniaria hemistemon; Suaedetum asphalticae; Salsoletum villosae. **106.** Association of Erodium glaucophyllum - Herniaria hemistemon; Suaedetum asphalticae; Salsoletum villosae; Atriplicetum Halimi. **107.** Chenoleetum arabicae. **108.** Chenoleetum arabicae; association of Chenolea arabica - Salsola villosa; Suaedetum asphalticae. **109.** Association of Chenolea arabica - Salsola arabica. **110 - 112.** Association of Anabasis articulata - Zilla spinosa. **113.** Association of Anabasis articulata - Zilla spinosa; Haloxylonetum salicornici. **114.** Halogetonetum alopecuroidis. **115.** Acacietum tortilidis palaestinum. **116.** Acacietum tortilidis palaestinum; Haloxylonetum salicornici. **116a.** Acacietum tortilidis palaestinum; Nitrarietum retusae. **117.** Association of Zizyphus Spina-Christi - Moringa aptera. **118.** Varthemietum iphionoidis; association of Carthamus tenuis - Ononis leiosperma; Viticetum Agni Casti. **119.** Telmissetum microcarpae; association of Cheilanthes fragrans - Ceterach officinarum; Crepidetum hierosolymitani; association of Carthamus tenuis - Ononis leiosperma. **120.** Association of Artemisia monosperma - Retama Roetam. **121.** Retametum Roetami. **122 - 124.** Haloxylonetum salicornici. **125.** Populetum euphraticae; association of Prosopis farcata - Glycyrrhiza glabra. **126.** Tamaricetum jordanis. **127.** Association of Cyperus Papyrus - Polygonum acuminatum. **128.** Association of Inula viscosa - Juncus acutus; Prosopidetum farcatae. **129.** Equisetetum ramosissimi. **130.** Association of Juncus maritimus - Schoenus nigricans. **131.** Association of Crypsis minuartioides - Heliotropium supinum. **132.** Platanetum orientalis. **133.** Salsolion tetrandrae; Suaedetum palaestinae. **134.** Atriplicetum Halimi; Salsolion tetrandrae; Suaedetum palaestinae. **135.** Association of Suaeda palaestina - Suaeda fruticosa. **136.** Association of Salsola tetrandra - Halogeton alopecuroides. **137 - 138.** Association of Carthamus tenuis - Ononis leiosperma.

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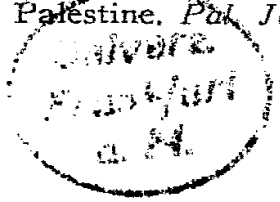
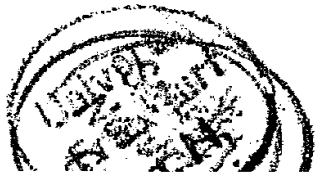
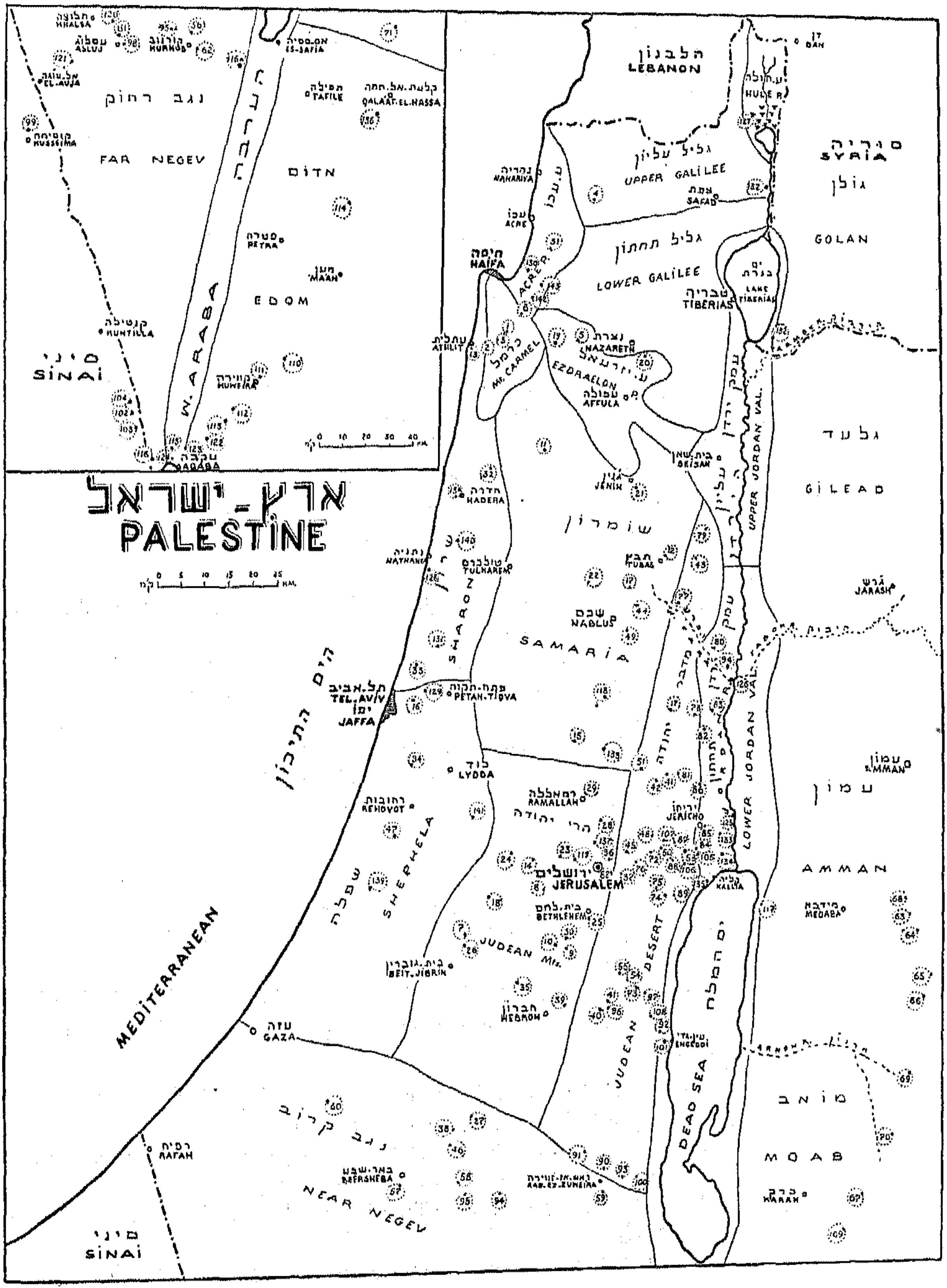






ארץ-ישראל
PALESTINE
LEBANON
לבנון
SYRIA
סוריה
UPPER GALILEE
גליל עליון
LOWER GALILEE
גליל תחתון
GOLAN
גולן
HAIFA
חיפה
ACRE
עכו
NAHARIYA
נהריה
SAFAD
צפת
TIBERIAS
טבריה
LAKE TIBERIAS
ים כנרת
NAZARETH
נצרת
ATHLIT
עתלית
MT. CARMEL
כרמל
EZDRAELON
AFFULA
עפולה
BEISAN
בית שאן
JENIN
HADERA
חדרה
NATHANIA
נתניה
TULKAREM
טולכרם
SHARON
TUBAS
NABLUS
שכם
SAMARIA
שומרון
UPPER JORDAN VAL.
GILEAD
גלעד
JARASH
גרש
TEL-AVIV
תל-אביב
JAFFA
יפו
PETAH-TIQVA
פתח-תקוה
LYDDA
לוד
REHOVOT
רחובות
RAMALLAH
רמאללה
JERICHO
יריחו
JERUSALEM
ירושלים
KALLIA
BETHLEHEM
בית-לחם
JUDEAN MTS.
הרי יהודה
JUDEAN DESERT
מדבר יהודה
SHEPHELA
שפלה
BEIT-JIBRIN
בית-גוברין
HEBRON
חברון
ENGEDDI
עין-גדי
DEAD SEA
ים המלח
LOWER JORDAN VAL.
AMMAN
עמון
MEDABA
מידבא
MOAB
מואב
KARAK
כרך
GAZA
עזה
RAFAH
רפיח
BEERSHEBA
באר-שבע
KAS. EZ-ZUWEIRA
NEAR NEGEV
נגב קרוב
MEDITERRANEAN
הים התיכון
SINAI
סיני
DAN
HULE R.
FAR NEGEV
נגב רחוק
KHALSA
ASLUJ
KURNUB
ES-SAFIA
EL-AUJA
KUSSEIMA
TAFILE
QALAAT EL-HASSA
EDOM
אדום
PETRA
פטרה
MAAN
מען
KUNTILLA
W. ARABA
HUWEIRA
AQABA
עקבה
KM.

EXPLANATIONS OF PLATES

PLATE V.

A: Association of *Pinus halepensis* — *Hypericum serpyllifolium* (Upper Galilee, env. of Yirka).

B: Association of *Quercus calliprinos* — *Pistacia palaestina* (env. of Eilon).

C: *Poterietum spinosi* (*mediterraneum*) (env. of Iksal, near Mt. Tabor).

D: *Artemisietum Herbae-albae* (Transjordan, Edom, betw. Ma'an and Ain Musa).

PLATE VI.

A: *Noëetum mucronatae* (Judean Desert, at km. 18 and 19 on the Jerusalem-Jericho road).

B: Association of *Retamo-Phlomion* (Eastern slopes facing the Jordan Valley south of Ain el Auja).

C: Association of *Salsola villosa* — *Stipa tortilis* (Lower Jordan Valley, Jericho — Dead Sea plain, about 2—3 kms. SSE of Jericho on the Jericho — Deir Hajla road).

D: Association of *Anabasis articulata* — *Notoceras bicorne* (Lower Jordan Valley, Jericho — Dead Sea plain, about 3 kms. SSE of Jericho on the Jericho — Deir Hajla road).

E: *Zygophylletum dumosi* (Negev, 4 kms. N of Asluj).

PLATE VII.

A: *Cheiroleetum arabicae* (Judean Desert, at km. 21—22 on the Jerusalem — Jericho road).

B: Association of *Anabasis articulata* — *Zilla spinosa* (Transjordan, Edom, 41 km. from Ma'an to Aqaba, Plain of Hisma).

C: *Suaedetum asphalticae* (Judean Desert, opposite km. 27—28 on the Jerusalem — Jericho road).

D: *Acacietum tortilidis Retametosum* (Far Negev, about 2 km. N of Naqb Aqaba).

PLATE VIII.

A: Association of *Zizyphus spina-Christi* — *Balanites aegyptiaca* (Lower Jordan Valley, Auja Plain — general view).

B: *Parthenietum iphionoidis* (Samaria, near Sawiya, N of Lubban, on dolomitic rocks).

C: *Origanetum Dayi* (Near Negev, a few kms. W of Naqb Zuweira).

D: *Retametum Roetami* (Southern Negev, 11 kms. N of Auja el Hafir).

PLATE IX.

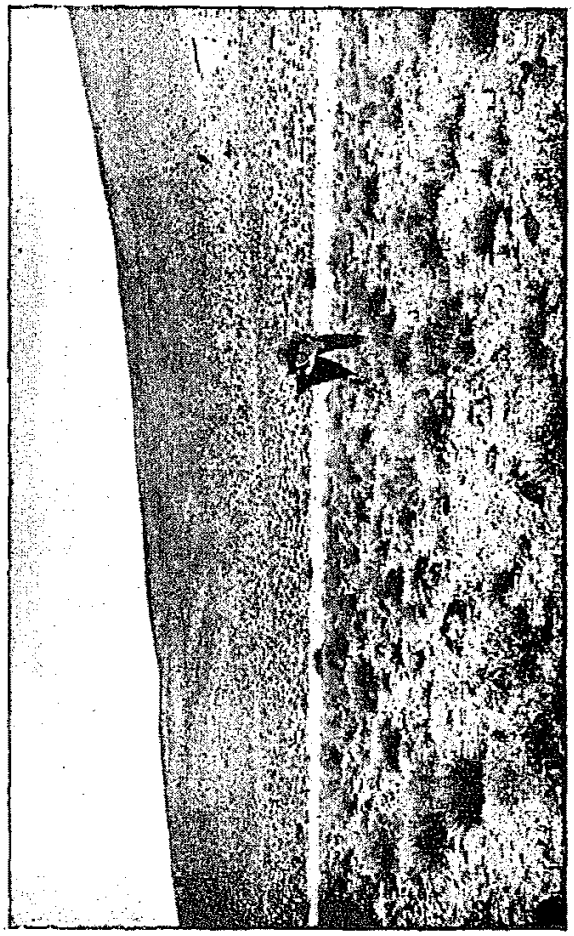
A: Association of *Haloxylonetum salicornici*: *Haloxylonetosum persici* (Transjordan, Edom, 12 kms. S of Quweira).

B: Associations of *Cyperus Papyrus* — *Polygonum acuminatum* (Huleh Plain, Huleh swamps, banks of Jordan).

C: *Salsoletum tetrandrae* (Transjordan, Edom, about 14 kms. S. of Hasa).

D: *Atriplicetum Halimi* (Lower Jordan Valley, N of Jericho).

B



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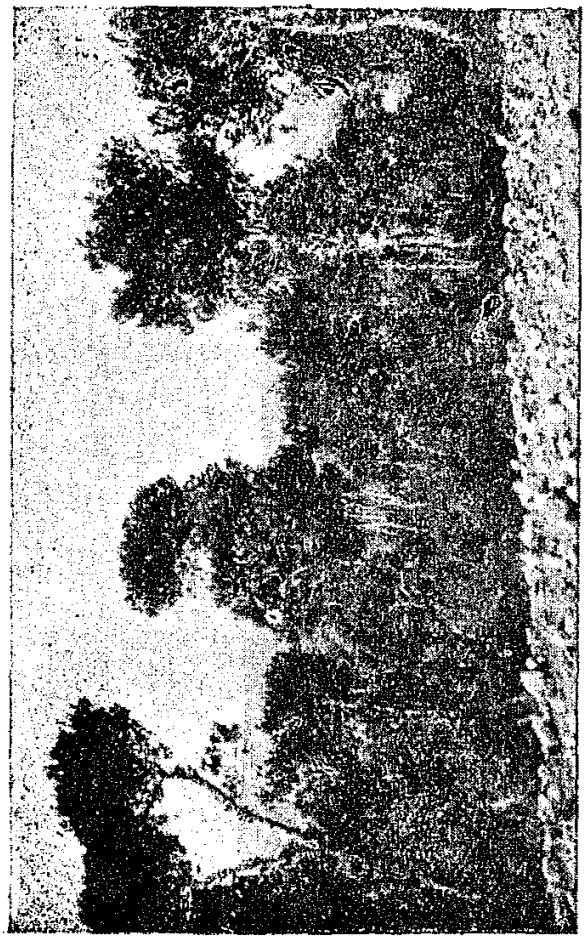

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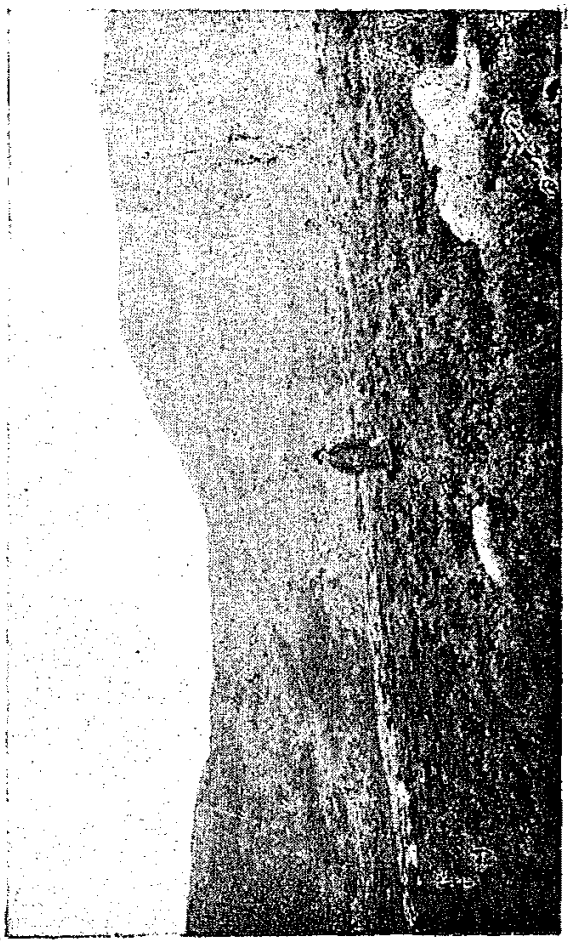

C

EIG — THE PHYTOSOCIOLOGICAL UNITS OF PALESTINE

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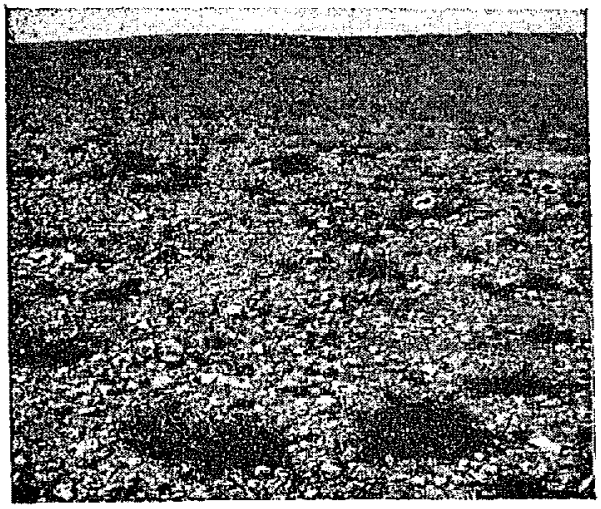

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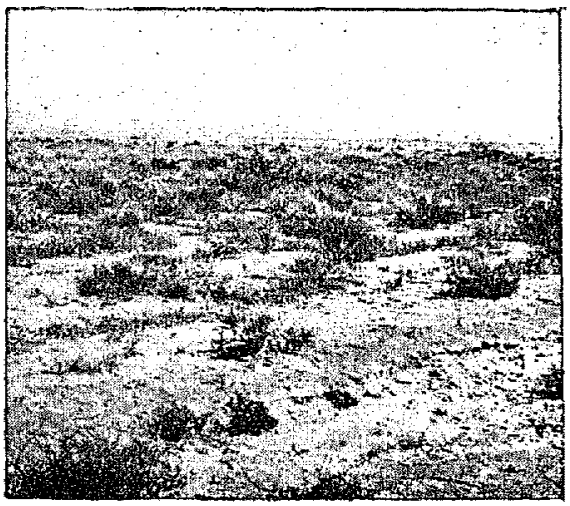

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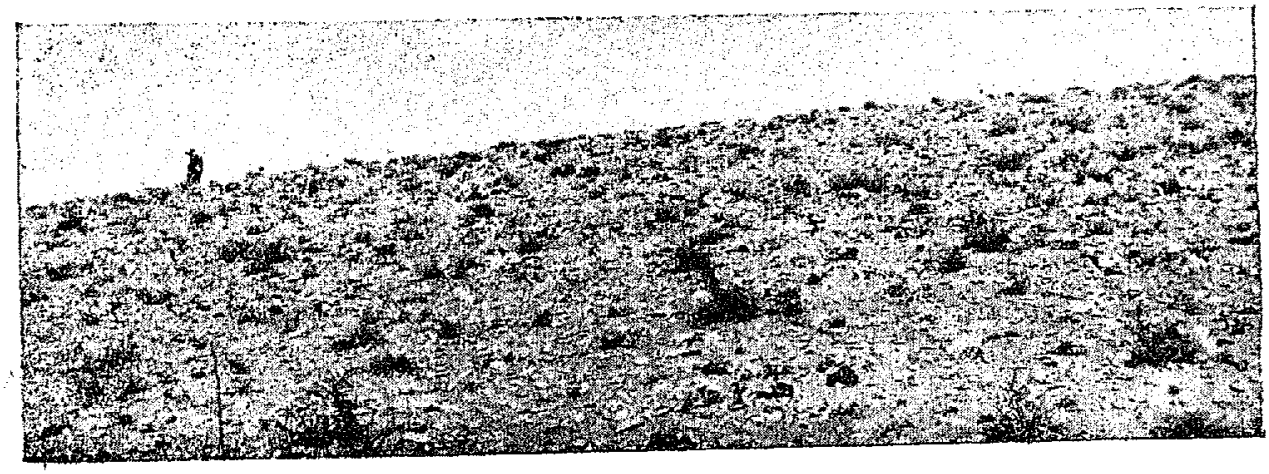

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C

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A

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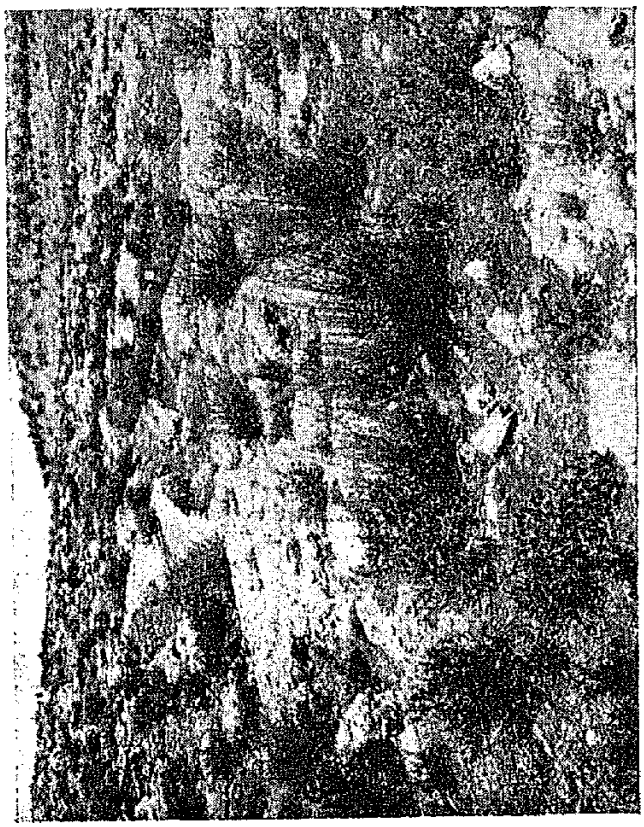
EIG — THE PHYTOSOCIOLOGICAL UNITS OF PALESTINE



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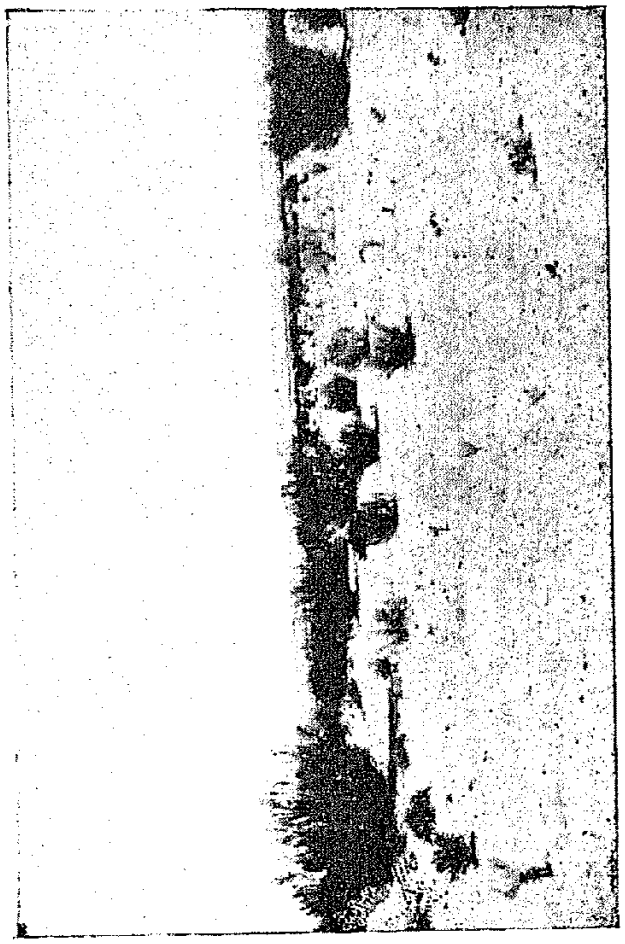

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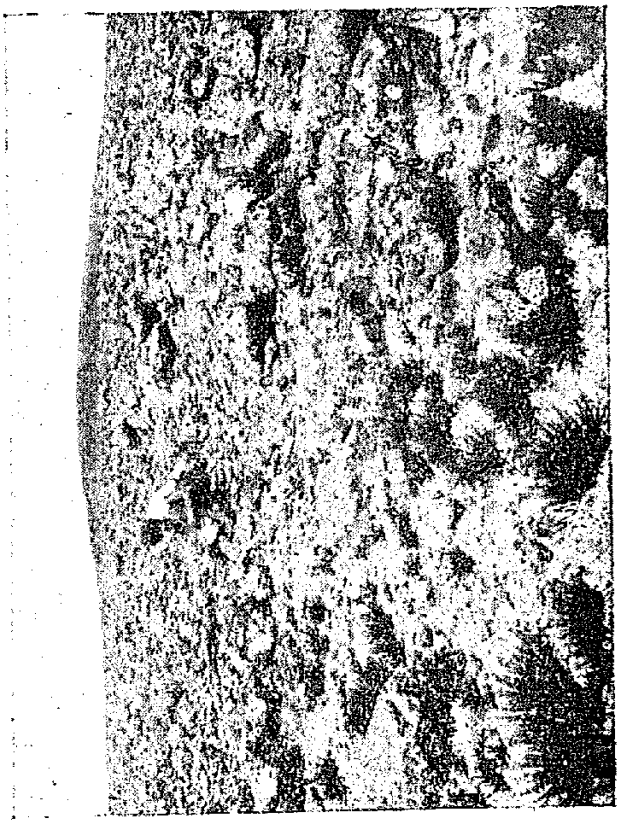

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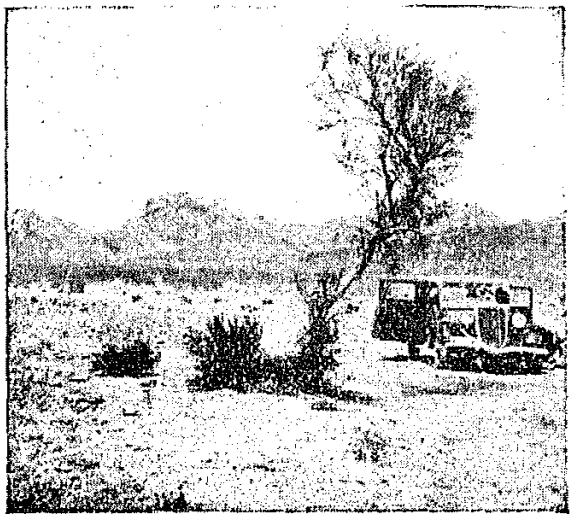

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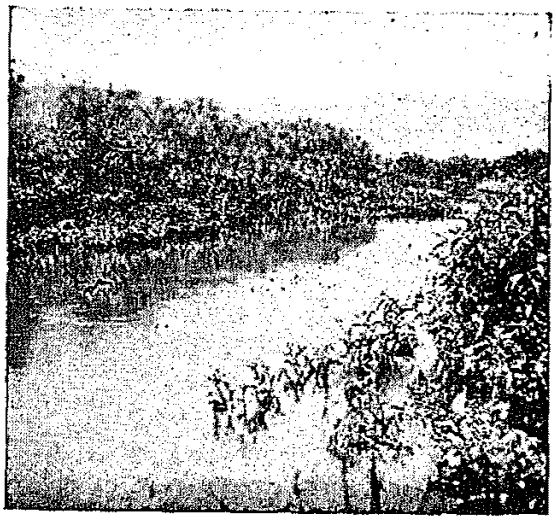

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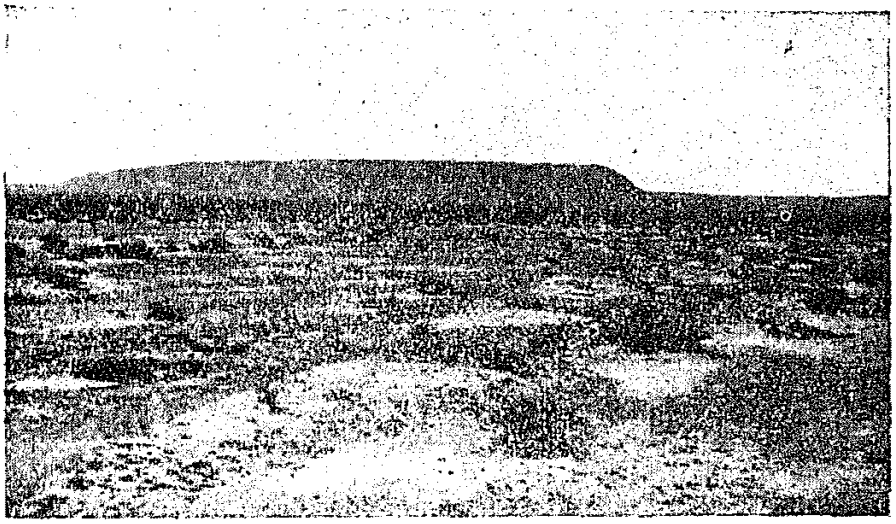

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