

THE MAQUIS OF *CERATONIA SILIQUA* IN ISRAEL *

(with 1 map, 2 plates and 3 tables)

by

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The class of *Quercetea calliprini* of Israel, which comprises the bulk of the local Mediterranean zonal vegetation, consists of three orders: the *Quercetalia calliprini*, i.e. the maquis and forests, the *Poterietalia spinosi*, i.e. the garigue and batha (dwarf shrub formation) and the *Ballotetalia undulatae*, i.e. the semisteppe plant communities of the Mediterraneo — Irano-Turanian borderland (ZOHARY, 1955, 1959). Within the *Quercetalia*, four main alliances are distinguished: the *Quercion calliprini*, the *Pinion halepensis*, the *Quercion ithaburensis* and the *Ceratonio-Pistacion lentisci*. The latter is discussed in this article.

THE CERATONIO — PISTACION LENTISCI

1. Appearance and composition

The *Ceratonio-Pistacion* alliance has a park-like appearance with single trees of *Ceratonia siliqua* scattered among evergreen shrubs, of which *Pistacia lentiscus* is the dominant. This alliance is related to the *Oleo-Ceratonion* described by BRAUN-BLANQUET et al. (1952) but it differs largely in composition. It includes three main associations: 1 - *Ceratonieto-Pistacietum lentisci typicum*, occupying the western foothill region of Israel (ZOHARY, 1944); 2 - *Ceratonieto-Pistacietum lentisci arenarium*, occurring on consolidated dunes of the Sharon Plain (ZOHARY, 1944) and 3 - *Ceratonieto-Pistacietum lentisci orientale*, limited mainly to the eastern slopes of the main mountain range facing the Jordan Valley and bordering partly on the Irano-Turanian territory of the country.

The floristic composition of this alliance as a whole is exceedingly rich. In the 50 records collected, over 300 species have been noted of which only a small number is characteristic to the alliance. The majority of the species occur also in other alliances of the *Quercetea* as well as in other classes. A significant proportion of the plants are segetals and

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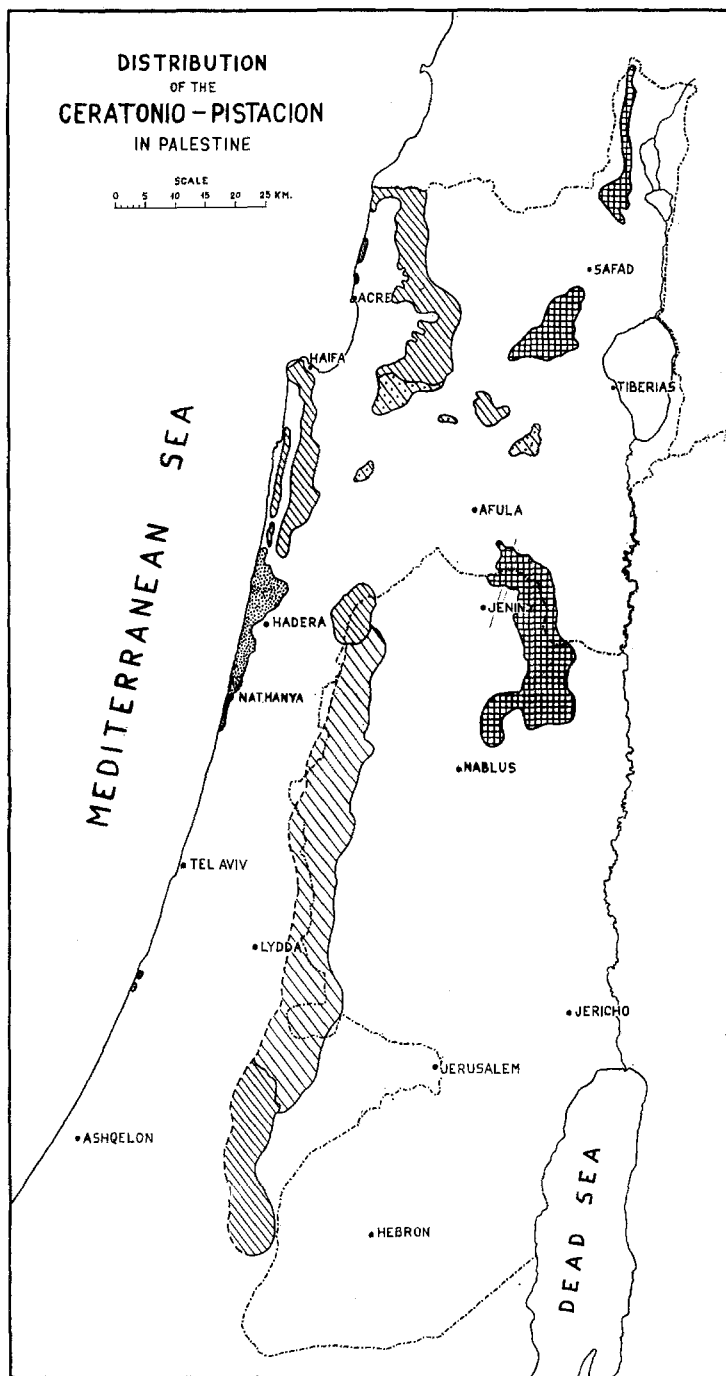
pioneer species of various successional seres; they are mostly annuals which find favourable conditions in the rather open *Ceratonia* maquis. Some trees and shrubs of adjacent maquis and forest communities occur sometimes within the *Ceratonia* maquis. Examples are: *Quercus calliprinos*, *Quercus ithaburensis*, *Pistacia palaestina*, *P. atlantica*, *Styrax officinalis*, *Phillyrea media*, *Amygdalus communis*.

The ecological requirements of this alliance are rather wide. It occurs on terra rossa, rendzina, calcareous sandstone (kurkar) and consolidated dunes but not on swampy soil and shifting sand. It grows under an annual rainfall ranging from 400 to 1000 mm., and under relatively high winter temperatures. Generally the communities under review do not occur on the mountains above the altitude of 300 m., although single specimens of *Pistacia lentiscus* and *Ceratonia siliqua* are found at higher elevations, within the *Quercus calliprinos* - *Pistacia palaestina* association. So far this alliance has not been found in the Mediterranean part of Transjordan, where elevations are higher and climate more continental. However, *Ceratonia* stands have been recently recorded (KASAPLIGIL, 1956) from Um Qeis in the Yarmuk area of that country.

At this juncture it may be remarked that both *Ceratonia siliqua* and *Pistacia lentiscus*, although Omni-Mediterranean in their overall distribution, suggest a tropical origin as inferred from the following: In his „Voyage au Yemen” (1889) DEFLERS writes on *Ceratonia*: „Les gorges irriguées qui s’ouvrent au pied du Gebel Sabor, à peu de distance au sud de la ville de Tâez sont ombragées par des caroubiers très vieux, dont le tronc mesure de 1 à 2 mètres de circonférence et qui atteignent une hauteur de 10 à 12 mètres. Ces arbres, dans le voisinage desquels sont venues s’abriter quelques habitations disséminées et de maigres cultures, m’ont paru d’origine absolument indigène. Si le fait venait à être confirmé par une enquête plus approfondie, la question, jusqu’à présent restée douteuse, de la véritable patrie du caroubier se trouverait ainsi en partie résolue. L’espèce est répandue, dit-on, dans toute la région moyenne des montagnes, jusqu’aux environs de Sûda et probablement jusque dans l’Asyr; mais nulle part elle n’est l’objet d’aucun soin particulier de culture”. Striking also is the fact that *Ceratonia* is the only tree of the local Mediterranean maquis and forest which flowers in late summer, a feature common to several other tropical trees in this country.

Pistacia lentiscus, an Omni-Mediterranean species, is also indigenous in Somaliland, Southern Abyssinia and Tanganyika (ZOHARY, 1952, PICHI-SERMOLLI, 1955) and is represented in these countries by the type and a variety hardly distinguishable from it. This may, perhaps, point to the origin of this species in Tropical East Africa.

The accompanying map shows the distribution of the *Ceratonia* - *Pistacia* alliance within Palestine. It occurs both west and east of the main western mountain range. On the western slopes it reaches its southern limit in the vicinity of Duweima (near Hebron), while on the eastern side its limit is further north, near Tubas in Samaria. The northern expansion is as far as Lebanon and Syria. However, fragments are also found in southern Turkey. There are data on the occurrence of *Ceratonia siliqua* - *Pistacia lentiscus* communities from other Mediterranean countries, but their phytosociological make-up is unknown to us.



- 1. *Ceratonieta-Pistacietum lentisci* typicum with moderately affected stands.
- 2. The same confined to favourable slopes.
- 3. The same but devastated and represented only by scattered *Ceratonia* trees.
- 4. *Ceratonieta-Pistacietum lentisci arenarium*.
- 5. *Ceratonieta-Pistacietum lentisci orientale*. Western approximate demarcation line of *Ceratonieta-Pistacietum lentisci* typicum, the latter gradually merging into the *Hypparrhnietea* communities.

The area of distribution of this alliance seems not to have changed considerably during human history, as man has always evaluated highly the carob tree as a source of fodder for his livestock and even has grafted it with cultivated varieties.

2. The plant associations

I. *Ceratonieto-Pistacietum lentisci typicum* (*Ceratonia siliqua*-*Pistacia lentiscus* association, EIG, 1946). Plate I, A, B.

a. Floristic composition and location of records

TABLE 1. ANALYTICAL LIST OF SPECIES OF THE *CERATONIETO-PISTACIETUM LENTISCI TYPICUM* (32 records)

<i>Characteristic species of association</i> ¹⁾			
28	<i>Olea europaea</i> var. <i>oleaster</i>	38 p	<i>Salvia triloba</i>
59 d	<i>Ephedra campylopora</i>		
<i>Characteristic species of alliance</i>			
100	<i>Ceratonia siliqua</i>	35 p	<i>Prasium majus</i>
100	<i>Pistacia lentiscus</i>	22 p	<i>Ruta graveolens</i>
<i>Characteristic species of Quercetalia calliprini</i>			
91	<i>Rhamnus palaestina</i>	32	<i>Clematis cirrhosa</i>
66	<i>Poterium spinosum</i>	22	<i>Crataegus azarolus</i>
66	<i>Calycotome villosa</i>	13	<i>Smilax aspera</i>
63	<i>Phillyrea media</i>	13	<i>Pistacia palaestina</i>
59	<i>Asparagus aphyllus</i>	13	<i>Tamus communis</i>
44	<i>Rubia olivieri</i>	10	<i>Quercus calliprinos</i>
<i>Characteristic species of Poterietalia spinosi</i>			
81	<i>Phagnalon rupestre</i>	22	<i>Majorana syriaca</i>
66	<i>Poterium spinosum</i>	13	<i>Althaea setosa</i>
66	<i>Calycotome villosa</i>	10	<i>Teucrium divaricatum</i>
63	<i>Dactylis glomerata</i>	10	<i>Salvia hierosolymitana</i>
50	<i>Pollinia distachya</i>	6	<i>Helichrysum sanguineum</i>
38	<i>Teucrium polium</i>	6	<i>Cistus salvifolius</i>
35	<i>Micromeria nervosa</i>	3	<i>C. villosus</i>
28	<i>Thymus capitatus</i>	3	<i>Fumana thymifolia</i>
<i>Characteristic species of Ballotetalia undulatae</i>			
81	<i>Asphodelus microcarpus</i>	13	<i>Scrophularia xanthoglossa</i>
47	<i>Stipa tortilis</i>	13	<i>Ballota undulata</i>
25	<i>Convolvulus dorycnium</i>	6	<i>Heliotropium rotundifolium</i>
25	<i>Dianthus multipunctatus</i>	6	<i>Salvia dominica</i>
22	<i>Ononis reclinata</i>	3	<i>Onopordon palaestinum</i>
16	<i>Echinops viscosus</i>	3	<i>Anchusa strigosa</i>
16	<i>Gundelia tournefortii</i>	3	<i>Alkanna strigosa</i>
13	<i>Linaria aegyptiaca</i>	3	<i>Psoralea bituminosa</i>

¹⁾ The lists of plants recorded here and in the following associations have been considerably shortened through omission of low-presence companions. The originally tabulated lists are preserved in the Department of Botany, Hebrew University, Jerusalem. The abbreviations are as follows: p = preferentials, r = regionals, d = differentials. The numbers preceding the names are percentages of presence.



Plate I A. Stand of *Ceratonieto-Pistacietum lentisci typicum* (Mt. Carmel).

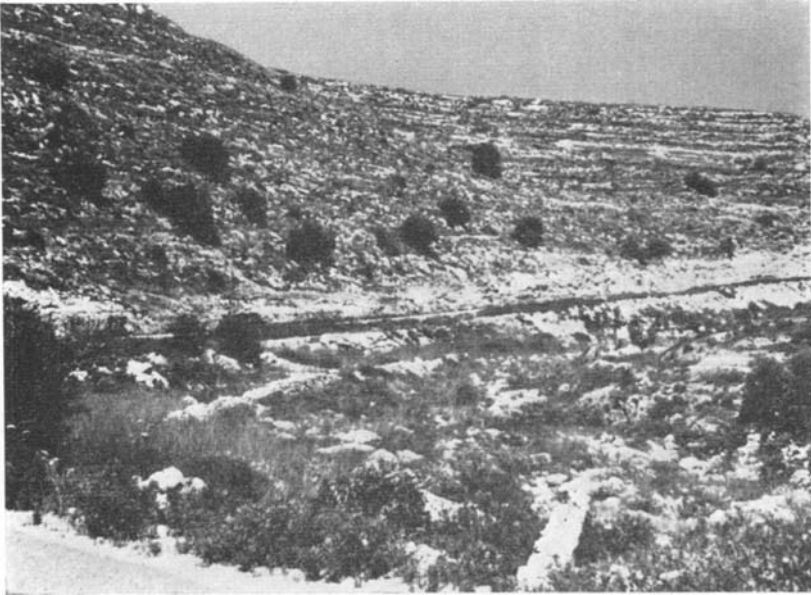


Plate I B. Scattered *Ceratonia trees*, remnants of a *Ceratonieto-Pistacietum lentisci typicum*, from which *Pistacia* has been removed (Judaean Hills).

Pioneer species of the Quercetea and the wides

75	<i>Avena sterilis</i>	32	<i>Carlina corymbosa</i>
66	<i>Hordeum bulbosum</i>	28	<i>Briza maxima</i>
63	<i>Lagoecia cuminoides</i>	25	<i>Hedypnois cretica</i>
59	<i>Crucianella macrostachya</i>	25	<i>Caucalis tenella</i>
53	<i>Plantago cretica</i>	22	<i>Ranunculus asiaticus</i>
53	<i>Pallenis spinosa</i>	22	<i>Atractylis comosa</i>
53	<i>Bromus fasciculatus</i>	19	<i>Crupina crupinastrum</i>
44	<i>Catananche lutea</i>	16	<i>Pterocephalus involucreatus</i>
41	<i>Allium stamineum</i>	6	<i>Anemone coronaria</i>
38	<i>Paronychia argentea</i>	6	<i>Helianthemum salicifolium</i>
35	<i>Oryzopsis miliacea</i>		

Characteristic species of the Hyparrhenietea

- 66 *Hyparrhenia hirta*

Characteristic species of the Rudereto-Secalinetea

63	<i>Trifolium campestre</i>	22	<i>Hymenocarpus circinnatus</i>
56	<i>Eryngium creticum</i>	19	<i>Cichorium pumilum</i>
47	<i>Carthamus tenuis</i>	16	<i>Aegilops peregrina</i>
41	<i>Plantago psyllium</i>	16	<i>Anagallis coerulea</i>
35	<i>Rhagadiolus stellatus</i>	16	<i>Phalaris paradoxa</i>
28	<i>Brachypodium distachyum</i>	16	<i>Nigella ciliaris</i>
28	<i>Koeleria phleoides</i>	13	<i>Synelcosciadium carmeli</i>
25	<i>Daucus maximus</i>	10	<i>Campanula strigosa</i>
22	<i>Lolium rigidum</i>		

Location of records ¹⁾

Rec. 1, 2 (3. 4. 1957): Western slopes of Mt. Carmel, about 1 km. south of Haifa; grey, shallow and compact rendzina soil; inclination 25-30°; total coverage 80-90%.

Rec. 3, 4 (3. 4. 1957): Mt. Carmel, env. of Iqsim, S.W. slope; hard Turonian rock; brownish-red terra rossa soil; inclination 15-20°; total coverage 90-100%.

Rec. 5-7 (10. 6. 1957): Samaria, about 13 km. S.E. of Ar'ara village; rec. 5 and 7-N.E. slope; rec. 6-S.W. slope; hard Turonian rock; brownish-red terra rossa soil; inclination 15-20°; total coverage 35-40%.

Rec. 8, 9 (10. 6. 1957): Ibidem, about 0,5 km. E. of Maanith; rec. 8-N. slope; rec. 9-S.W. slope; rock and soil as above; total coverage 30-40%.

Rec. 10 (10. 6. 1957): Southern Mt. Carmel, E. of Benyamina, transition camp, W. slope of Senonian hill; greyish-brown rendzina soil; inclination 5°; total coverage 95%.

Rec. 11 (10. 6. 1957): Ibidem, N. of rec. 10; slope and inclination as above; hard Turonian rock yielding brownish-red terra rossa soil; total coverage 60%.

Rec. 12-14 (10. 6. 1957): Ibidem, in the vicinity of Ramat Hanadiv; hard Cenomanian rock underlying dark terra rossa soil; total coverage 70-90%.

Rec. 15 (10. 6. 1957): Ibidem, S. of Zikhron Yaaqov, W. slope; rock and soil as above; inclination 25°; total coverage 90%.

Rec. 16, 17 (7. 4. 1958): Sharon Plain, vicinity of Atlit, E. slope; ridge of kurkar sand stone hills; dark grey sandy soil; inclination 10-15°; total coverage 80-90%.

Rec. 18-21 (7. 4. 1958): Ibidem, vicinity of Sdeh-Yam; rock and soil as above; total coverage 60-80%.

Rec. 22-26 (17. 6. 1957): Judean foothills, between Zakhariya and Tirosh; Eocene rock; greyish-brown soil; total coverage 60-80%.

Rec. 27-29 (17. 6. 1957): Ibidem, between Deir Duban and Beit-Guvrin; rock, soil and coverage as above.

Rec. 30 (17. 6. 1958): Ibidem, between Lakhish and Amatzyah, N.W. slope; rock and soil as above; inclination as in rec. 16, 17; total coverage 70%.

¹⁾ Quadrat size in all records 500 sq.m.

Rec. 31, 32 (17. 6. 1958): Ibidem, km. 49 and 50 on the road between Beit-Guvrin and Hartuv; lower Eocene soft white rock yielding light grey rendzina soil; total coverage 80%.

b. Distribution and ecology

The *Ceratonieto-Pistacietum typicum* occupies almost a continuous belt along the foothills or the lower terraces of the Cisjordanian mountains, from the latitude of Duweima in the south (near Hebron) to the Lebanese frontier in the north. This belt also includes the range of hard calcareous-sandstone hills (kurkar) between Athlit and Kefar Zerka, opposite Mt. Carmel. The largest part of its area borders on the *Quercus calliprinos - Pistacia palaestina* association to the east, and on the associations of the *Hyparrhena* to the west.

This association is the most characteristic of the Mediterranean vegetation of Israel. Due to its park-like structure and its proximity to the alluvial plains cultivated since ancient times, it is the harbour of many components of the local light-demanding batha and garigue shrubs and also a penetration area of many ruderal and segetal species. Hence the large number of species gathered within this association. In fact, no other maquis community adorns the landscape in springtime with such an abundance of flowers as this. For the sake of brevity we could not record but a part of the 250 species noted in this association, the low presence components being omitted.

Grazing and fuel collecting always interfered with this community, but its arboreal elements have never been totally destroyed. Even when heavily affected, trees of *Ceratonia* have been left for their shade and use as fodder. As both *Ceratonia* and *Pistacia* are able to penetrate rocks of considerable hardness, soil erosion which took place on the mountain sides for centuries caused less harm to these trees than to others.

There are sufficient reasons to divide this association into two variants, namely into the subassociation *oleosum*, comprising all the stands of north-western Israel (N. of Mt. Carmel) and the sub-association *judaicum*, comprising the stands of the Hartuv-Beit-Guvrin area of the Judaeen foothills. The former enjoys a rainfall of 600-1000 mm., whereas the subassociation *judaicum* is limited to the 600-400 mm. isohyetes. Floristically, the northern variant is richer in species of the *Poterietalia* order, while the southern one includes many species of the *Ballotetalia*, in addition to *Rhamnus palaestina* and *Hyparrhenia hirta* which are especially dominant.

We know very little about the syngenetics of this association. Although seedlings of *Ceratonia* and *Pistacia* are sometimes found under the canopy of older plants, it is doubtful whether under present ecological conditions this community is able to expand or even to reestablish itself in areas from which it has been eradicated. However, there is no doubt that the *Ceratonieto - Pistacietum typicum* is a climax community developed through batha and garigue successional stages.

II. *Ceratonieto-Pistacietum lentisci arenarium* (*Ceratonia siliqua - Pistacia lentiscus* association, EIG, 1939). Plate II, A.



Plate II A. *Ceratonieta-Pistacietum lentisci arenarium*,
on consolidated sand dunes (Env. of Caesarea, Sharon Plain).

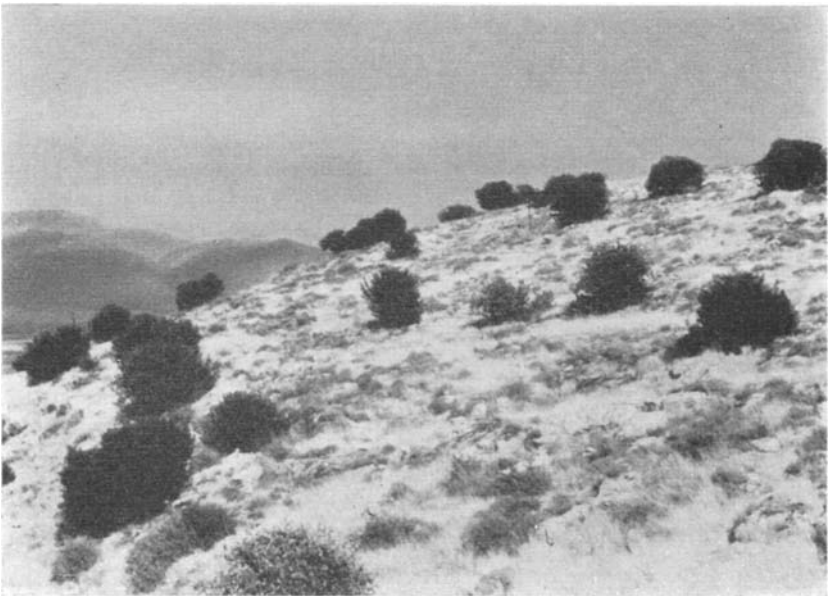


Plate II B. *Ceratonieta-Pistacietum lentisci orientale*
(Eastern slopes of Upper Galilee mountains).

a. Floristic composition and location of records

TABLE 2. ANALYTICAL LIST OF SPECIES OF THE CERATONIETO-PISTACIETUM LENTISCI ARENARIUM (9 records)

<i>Characteristic species of association</i>			
67 r	Lycium barbarum	56 r	Ephedra alte
56	Ballota philistaea	44 r	Asparagus stipularis
<i>Characteristic species of alliance</i>			
100	Pistacia lentiscus	56 p	Prasium majus
100	Ceratonia siliqua	44 p	Ruta graveolens
<i>Characteristic species of Quercetalia calliprini</i>			
44	Rhamnus palaestina	11	Quercus calliprinos
11	Rh. alaternus		
<i>Characteristic species of Poterietalia spinosi</i>			
11	Cistus salvifolius	11	C. villosus
<i>Characteristic species of Retametea raetami (psammophytes, being differentials against the other associations of the alliance under review)</i>			
89	Artemisia monosperma	67	Cutandia philistaea
89	Daucus littoralis	67	Polygonum palaestinum
89	Rumex bucephalophorus	44	Lagurus ovatus
89	Trifolium palaestinum	33	Ambrosia maritima
78	Crepis aculeata	33	Thymelaea hirsuta
78	Centaurea procurrans	33	Chrysanthemum viscosum
78	Anchusa aggregata	33	Nigella arvensis ssp. tuberculata
67	Aegilops sharonensis	22	Hippomarathrum boissieri and others
67	Bromus rigens		
<i>Species of other classes - mainly of Rudereto-Secalinetea</i>			
67	Papaver rhoeas	67	Senecio vernalis
67	Paronychia argentea	67	Aegilops peregrina and others
67	Koeleria phleoides		

Location of records

Rec. 1, 2 (10. 6. 1957): Sharon Plain, consolidated sand dunes E. of Mikhmoret; grey soil containing slight amounts of humus; total coverage 80%.

Rec. 3, 4 (7. 4. 1958): Ibidem, consolidated sand dunes between Natanya and Kefar Vitkin; 100-200 m. off sea shore; soil as above; total coverage 90%.

Rec. 5-7 (7. 4. 1958): Ibidem, undulating plain of more or less consolidated sand containing some humus, between Mikhmoret and Givat Olga; total coverage 80%.

Rec. 8, 9 (7. 4. 1958): Ibidem, consolidated sand dunes N. of Caesarea; soil as above; total coverage 70-80%.

b. Distribution and ecology.

The vegetation of the sandy soil belt of the Coastal Plain was thoroughly studied by EIG (1939). He grouped the plant communities of the dunes and the sandy soils near the sea shore into two alliances, *Lotion cretici* and *Artemision monospermae*, both included within the *Retametalia arenaria* order. It is within the territory

of these two alliances that stands of the *Ceratonieto - Pistacietum lentisci* are found in the Sharon Plain, in the area between Wadi Falik and Caesarea. The fact that small fragments of this association also occur north of the Acre Plain (environs of Nahariya) as well as south of Wadi Rubin, suggests that this association was once much more common in the light soil belt than it is to-day and that severe erosion in the littoral belt of the Coastal Plain is responsible for its partial disappearance from this Plain. Testimony to this suggestion is supplied by the fact that in the deflated sand flats west of Ma'agan Mikhael one finds partially dried-out specimens of *Ceratonia* in which the root system has been almost entirely exposed. Dead branches of *Ceratonia* have also been found buried in the recently accumulated sand hillocks inhabited by stands of *Artemisia monosperma*. It may thus be suggested that the *Ceratonieto - Pistacietum arenarium* is a relic association, which originally inhabited sandy loams or sandstone hills in the proximity of the sea, but more recently has been affected by storms leading to the partial disappearance of this association and its replacement by the *Artemisia monosperma - Cyperus mucronatus* association.

One should thus look on the components of the *Retametea* class, as mentioned above, as elements syngenetically alien to the *Ceratonia - Pistacia* association. In other words, while we are completely ignorant as to the successional stages that have once led to the *Ceratonia - Pistacia arenarium* climax there is no doubt that this association is at present at a retrogressive stage, due to a recently enacted erosion cycle leading to dune formation and to the expansion of the *Retametea* associations on account of the *Ceratonia* maquis in the Coastal Plain.

On the high shore *Pistacia* can be observed within the spray zone, while *Ceratonia* is not found on the shore, and the first exposed specimens are strongly wind-shaved.

III. *Ceratonieto-Pistacietum lentisci orientale* Plate II, B.

a. Floristic composition and location of records

TABLE 3. ANALYTICAL LIST OF SPECIES OF THE *CERATONIETO-PISTACIETUM LENTISCI ORIENTALE* (9 records)

<i>Characteristic species of association</i>			
44 d	<i>Pistacia atlantica</i>	22 d	<i>Capparis sicula</i>
44 p	<i>Amygdalus communis</i>	11 d	<i>Zizyphus lotus</i>
<i>Characteristic species of alliance</i>			
89	<i>Ceratonia siliqua</i>	11	<i>Pistacia lentiscus</i>
<i>Characteristic species of Quercetalia calliprini</i>			
89	<i>Styrax officinalis</i>	44	<i>Pistacia palaestina</i>
67	<i>Asparagus aphyllus</i>	22	<i>Crataegus azarolus</i>
67	<i>Rhamnus palaestina</i>	11	<i>Quercus calliprinos</i>

Characteristic species of Poterietalia spinosi

100	Phagnalon rupestre	44	Micromeria nervosa
78	Majorana syriaca	44	M. juliana
56	Poterium spinosum	22	Salvia judaica
56	Ephedra campylopoda	11	Pollinia distachya

Characteristic species of Ballotetalia undulatae

56	Ballota undulata	33	Heliotropium rotundifolium
44	Echinops viscosus	22	Scrophularia xanthoglossa

Pioneer species of the Quercetea and wides

100	Avena sterilis	44	Pallenis spinosa
56	Crupina crupinastrum	33	Briza maxima
44	Crucianella macrostachys	33	Bellevialia flexuosa
44	Carlina corymbosa	33	Scabiosa palaestina
44	Allium stamineum	33	Pterocephalus involucratum
44	Bromus fasciculatus	22	Oryzopsis caerulea

Characteristic species of the Hyparrhenietae

44	Hyparrhenia hirta
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Characteristic species of the Rudereto-Secalinetae

67	Hypericum crispum	44	Brachypodium distachyum
67	Hordeum ithaburense	33	Carthamus glaucus
44	Eryngium creticum	33	Synelcosciadium carmeli

Location of records.

Rec. 1 (7. 6. 1957): Eastern Galilee, W. of Al Buweiziya, E. slope; brownish terra rossa soil; total coverage 35%.

Rec. 2-7 (7. 6. 1957): Ibidem, E. slopes of the Nabi Yusha ridge; hard Cenomanian rock; dark brownish terra rossa soil; total coverage 40-70%.

Rec. 8, 9 (7. 6. 1957): Ibidem, about 3 km. N.E. of Sdeh-Eliezer; rock and soil as above; total coverage 60%.

b. Distribution and ecology

This association differs from the *Ceratonieta - Pistacietum typicum* by the presence of *Pistacia atlantica*, *Amygdalus communis* and *Zizyphus lotus*. Their occurrence here is due to the fact that this association borders on the Irano-Turanian vegetation of which these trees are the only arboreal representatives in Israel. They have no doubt penetrated into the Mediterranean territory after the local primary vegetation had been heavily affected by man. Another specific feature of this association is the absence of a series of true Mediterranean trees and shrubs, such as *Phillyrea media*, *Cistus villosus*, *C. salvifolius*, *Lonicera etrusca*, *Ruta graveolens*, *Prasium majus*, *Salvia triloba*, *Thymus capitatus*, etc. Also striking is the scarcity of *Pistacia lentiscus* and its replacement by *Styrax officinalis*.

A more thorough investigation of this association will probably lead to its subdivision into two variants, one centred in the eastern part of Samaria (the Gilboa-Tubas area) and the other characteristic of the slopes facing the Upper Jordan Valley (Nabi Yusha area). In the first, *Pistacia lentiscus* and a few other shrubs, as well as *Zizyphus lotus*, fill the spaces

between the scattered *Ceratonia* trees, whereas in the second interspaces between the three equally scattered tree species, *Ceratonia siliqua*, *Pistacia atlantica* and *Amygdalus communis*, are dominated by dwarf shrubs and hemicryptophytes of semi-steppe associations of the Ballot et alia.

It is very difficult to trace the syngenetical relations in this association, but the data strongly suggest that it is a relic association of a previous climatical cycle, when conditions were more favourable for tree growth than at present. Today, not a single seedling is to be found under the older carob, almond and pistacia trees. Present conditions of soil erosion and climate, therefore, appear to be such that prevent regeneration and the association may thus be looked upon as definitely static if not retrogressive, in its development.

Considering the Ceratonio-Pistacion of Israel from the point of view of altitudinal zonation, one is struck by the symmetrical arrangement of its associations on both sides of the main mountain range of Israel. Thus, a vegetational transect across Galilee, from the Mediterranean coast to the Huleh Plain, starts with the Ceratoniecto-Pistacietum typicum of the western foothills. This merges slowly into the Quercus calliprinos - Pistacia palaestina association which predominates in the higher mountain zone where on the mountain peaks fragments of a more northern Quercetum infectoriae are harboured. The eastern slopes are again occupied by the oriental variant of Ceratoniecto - Pistacietum. A similar zonation can also be traced further south in Samaria but not in Judaea where the eastern escarpments are too steep and, therefore, too dry and cold to allow the development of the Ceratonia - Pistacia maquis. Instead, the Quercus - Pistacia maquis are fringed here with a fragmentary zone of Pistacia atlantica, small stands of which are still encountered in the cities of Jerusalem, Bethlehem and Hebron.

SUMMARY

1 - A description of the three associations of the Ceratonio-Pistacion evergreen maquis is presented. Their distribution is shown in the accompanying map.

2 - It is shown that this alliance is thermophilic and occupies the lowest zone of the Mediterranean mountain maquis.

3 - In all the three associations no lines of syngenetical development can be indicated with certainty, even where man's interference is prevented. It seems that under the present climatical and edaphical conditions this type of vegetation has lost its dynamic potentialities.

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