

A Preliminary Research of the Effects of Global Warming on the Species Composition and Vegetation Productivity in the Eastern Mediterranean Region of Turkey

- The Vertical Distribution of the Dominant Tree Species -

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1. Introduction

There are various vegetation types along the climatic and topographic gradient in Turkey (Altan, 2000). Especially in the eastern Mediterranean region of Turkey, they contain grassland above the timber line, evergreen and deciduous forests, scrubland, river beds, lagoons, coastal saltmarshes, coastal woodland, and sand dunes (Fig. 1, Yilmaz, 1998). If global warming occurred, it will most likely affect the vertical distribution of the vegetation of this region through changing the distribution of each species.

2. Effects of past human activities on the vegetation in this region

This region has been affected by past human activities since at least the early Neolithic period (Yilmaz, 1998). Not only the mountain part of the region, but also the Ceyhan and Seyhan plains were covered with dense oak forests in the eighteenth century. People occupied densely settled villages, seasonally utilizing the uplands in their vicinity based on agriculture and pastoralism. The nomadic activities, which continued between the mountains and the plain, had a detrimental effect

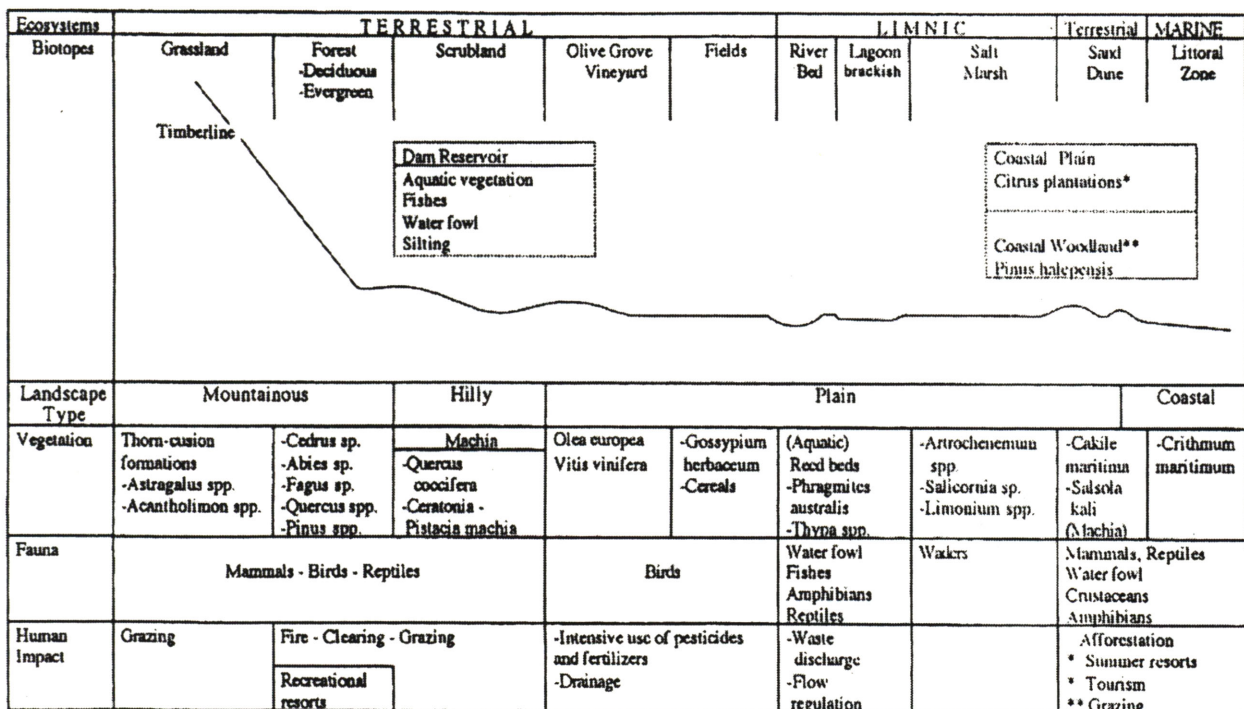


Fig. 1 Model of the ecosystem complex of the Eastern Mediterranean region (Yilmaz, 1998).

on the natural vegetation of the region.

Nomadic activities continued until the beginning of this century (Yilmaz, 1998). The most common livestock in this region are goats, which are grazed illegally in forest. People in this region also illegally take wood from the forest for daily use and for firewood in the winter. Therefore, it is difficult to find natural vegetation, especially in the plains and the low elevation area of the mountains.

3. Study area

The preliminary research of species identification and vegetation distribution were done at relatively good conditions left from the Mediterranean coast to the mountain region (ca. 1200 m a. s. l.). We observed three points, (1) Yumurtalik-Dalyan Natural Protection Area: Elevation: 0-5 m, N36°44', E35°37', (2) Kadirli National Park (Karatepe-Aslantas Acik Have Muzei): ca. 180 m, N37°18', E36°15', and (3) Aladag National Forest: ca. 1200 m, N37°29', E35°22',. (Fig. 2).

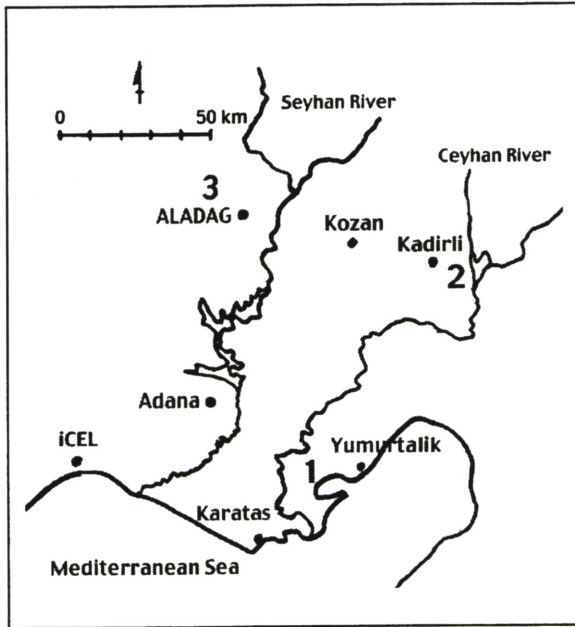


Fig. 2 Study area. 1-3: observation point.

4. Species distribution along latitude

The vertical distribution of dominant tree species in the Mediterranean region are usually as follows (Polunin and Huxley, 1990): (1) Elevation: 0-800 m, Evergreen broad-leaved tree

species such as *Quercus ilez*, *Q. coccifera*, *Q. suber*, *Pinus halepensis*, (2) Elevation: 800-1500 m, Deciduous broad-leaved tree species such as *Fagus spp.* and *Quercus spp.*, and (3) Elevation: 1500 m or more: Coniferous species such as *Abies spp.* and *Pinus spp.*

Yilmaz (1993) showed the potential of natural plant cover and actual vegetation type with the dominant species and geological aspects in the eastern Mediterranean region (Fig. 3). There are sand dune vegetation and Maki (scrub) v egetation from the coast to ca. 400 m a.s.l. *Pinus brutia* forests are found on serpentine rocks from 400 to 800 m. They include *Quercus cerris* over 800 m on limestone. *P. brutia* forests are gradually decreasing and *P. nigra* spp. *pallasiana* forests with *Q. cerris* are appearing from 800 to 1500 m. *Fagus orientalis* forests are found from 1500 to 2000 m (the forest limit) on the sandstone.

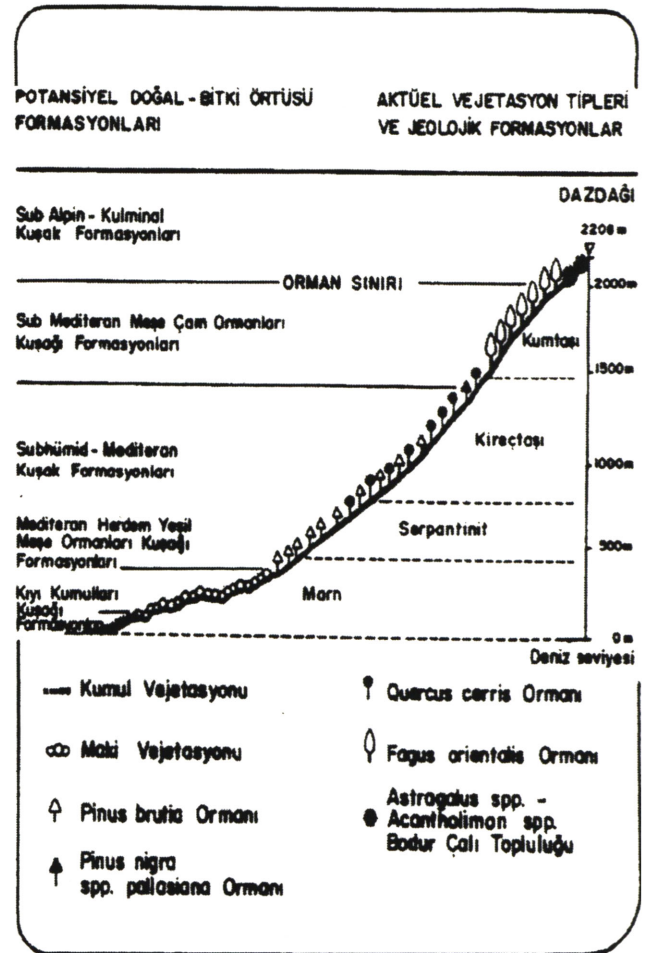


Fig. 3 Potential plant cover and actual species distribution on the geological base (Yilmaz, 1993 appearing in Yilmaz, 2001).

5. Dominant species in each point

(1) Yumurtalik-Dalyan Natural Protection Area

Trees

Quercus coccifera
Q. ithaburensis ssp. *macrolepis*
Pinus halepensis

Maki (Scrubs)

Myrtus communis
Pistacia leutiscu
P. terebinthus
Tamarix smyrnensis

Herbs

Eryngium maritimum
Saccharum ravennae
Smilax aspera
Salicornia europaea

(2) Kadirli National Park

Trees

Pinus pinea (plantation)
P. brutia
Quercus cerris
Q. petraea
Q. infectoria
Q. coccifera
Styrax officinalis
Morus alba
M. nigra

Maki (Scrubs)

Daphne oleoides
Arbutus andrachne
Hypericum spp.

(3) Aladag National Forest

Trees

Quercus coccifera
Q. cerris
Pinus brutia
P. nigra
Cedrus libani
Abies cilicica
Cupressus sempervirens
Juniperus oxycedrus
Carpinus betulus
Juglans regia
Platanus orientalis (riverside)

Shrub

Nerium oleander

There were some dominant species along the vertical gradient. *Quercus* species were the most abundant, which were followed by *Pinus* species. *Pinus halepensis* was found only on the Mediterranean coast, while *P. brutia* was distributed on the mid elevation to relatively high mountains and *P. nigra* was limited on the high mountain. In addition, Maki (scrub) species represented the coastal vegetation and *Cedrus*, *Abies*, *Cupressus*, *Juniperus* species did the high mountain vegetation.

Eleven species are included in genus *Quercus* in Turkey (Baytop, 1997). They are *Q. aucheri*, *Q. brantii*, *Q. cerris*, *Q. coccifera*, *Q. ilex*, *Q. infectoria*, *Q. ithaburensis*, *Q. libani*, *Q. petraea*, *Q. robur*, and *Q. vulcanica*. In the eastern Mediterranean five *Quercus* species were found in this preliminary research. Because the *Quercus* species have a relatively high drought tolerance (Abrams, 1990), they may increase their domination together with global warming in this region.

6. Further research

To estimate species response and vegetation productivity for the climate change, further researches concerning species composition, community structure, tree physiology, and growth patterns are required. We will set some plots with an interval of ca. 200-m elevation from the Mediterranean coast to the mountain region (ca. 1200 m a.s.l.).

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