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ENVIRONMENTAL PRESSURES AND THREATS OF THE RIPARIAN FOREST VEGETATION IN LAKE TRICHONIDA (GR2310009)

Stergiannis Panagiotis[1*], Efthimiou Georgios[2], Mertzanis Aristeidis[2],
[1*] Forester MSc, Karaiskaki 2, Karpenisi 36100, Greece
[2] Agricultural University of Athens, Iera Odos 75, Athina 118 55, Greece
** Correspondence author. E-mail*: panagsterian@gmail.com,* efthimiou@aua.gr

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ABSTRACT

This paper presents the main environmental problems, pressures and threats faced by the riparian forests of Lake Trichonida, which is located in Western Greece (a protected area of Natura 2000 network with Code GR2310009), with the method of completing "questionnaires". The main threat is human activities, such as intensive agriculture and animal husbandry, but also biotic factors such as the fungus Ceratocystis fimbriata f. sp. platani, which was recently identified in the plane forests of the lake. The majority of respondents pointed out bulky waste as the first, hierarchically, problem for the region. In the opinion of the respondents, the riparian forests of Lake Trichonida are largely threatened by: abandonment (60%), insufficient management (58%) and the risk of fire (32%). The lakeside forests are least threatened by: agriculture (60%), high number of visitors (50%), fire (48%).

INTRODUCTION

Riparian areas are unique ecosystems and ecotones that provide many ecosystem services. Their importance is even larger in dryland areas because of the water scarcity conditions. This is especially true in the Mediterranean region where their value has been recognized and utilized for thousands of years. This utilization has led to severe their degradation, and in many cases, elimination. The Mediterranean Basin is also considered one of the most sensitive regions to climate change impacts (Zaimes 2020). Freshwater wetlands around the Mediterranean Sea have decreased considerably in number and quality. Greece has lost two thirds of its wetlands during the last seventy-five years; however, many wetlands with considerable conservation value remained (Gerakis 1993, Kagalou et al. 2010, Mertzanis et al. 2011). Since then, extensive losses have occurred, many of the original wetlands have been drained and converted to farmland, industrial sittings, urban and touristic development. A wide range of human activities at the catchment's areas (intensification and development of agriculture projects, infrastructure works, hydroelectric power dams, irrigation dams and water supply dams), may lead to environmental deterioration of river waters or hydro-geomorphological changes and constitute the cause of environmental destabilization (Vavizos and Mertzanis 2003). According to Mertzanis et al. (2014), the intensification of human interventions, especially after the decade of 1950, in the delta area and in the drainage basin of some rivers in Western Greece (Epirus and Aitoloakarnania), such as those in the

delta area of some rivers (r. Arachthos, r. Acheloos), Kalodiki fen and Ziros lake, have affected the natural ecosystems and the protected wetlands.

In recent decades, peri-urban areas of Mediterranean cities have witnessed rapid land use changes, industrial development, intensive agricultural practices and poor water management practices, often causing the elimination or irreversible impacts on fragile water bodies such as coastal lagoons and small lakes (Ruiz-Luna and Berlanga-Robles 2003, Mentzafou et al. 2016).

Many urban, peri-urban areas and Natural Parks, in low elevation coastal zones in Greece are experiencing or are at risk of Sea-level rise, storm surges, water and soil pollution, saline water intrusion (salinity), coastal erosion and shoreline retreat, floods, and droughts (Mertzanis and Mertzani 2019). As a specific and non-neutral space, a peri-Urban area refers to a transition or interaction zone, where urban and rural activities are juxtaposed, and landscape features are subject to rapid modifications, including by human activities (Douglas 2006). Peri-Urban areas, include valuable protected areas, forested hills, preserved woodlands, prime agricultural lands and important wetlands. According to (McGranahan et al. 2004) observed that peri-urban zones are often far more environmentally unstable than either urban or rural settings. From ecosystem's point of view, physical, chemical and biological factors generally interact among themselves, and are interrelated with socioeconomic forces. These factors have their own functions, which can be enhanced or reduced depending on the conditions of other factors in the same system (Fang et al. 2005). A peri-Urban area is not only a zone of direct impact experiencing the immediate impacts of land demands from urban growth and pollution, but is also a wider market-related zone of influence that is recognizable in terms of the handling of agricultural and natural resource products (Simon et al. 2006). Man-made interventions combined with Climate Change and the expected sea-level rise affect the coastal wetland ecosystems, urban and peri-urban areas. Also affect various sectors of the economy, including infrastructure and land-use planning, agricultural production, sufficiency of goods and services, quality of life and public health and well-being of urban and rural communities (Mertzanis and Mertzani 2019).

MATERIAL AND METHODS

Lake Trichonida (Fig. 1) is located in the southeastern part of the Prefecture of Aitoloakarnania. It has been included in the European Ecological Network 'NATURA 2000' with code GR2310009 (EEA 2021) as a Special Area of Conservation (SAC). Lake Trichonida is the largest and deepest lake in Greece (Seguin et al. 2020).

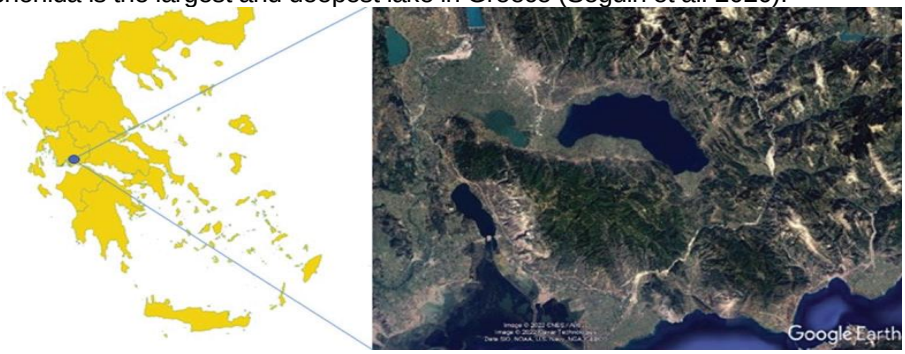

Figure 1. The case study (Papathanassiou 2016–2022) and Lake Trichonida (www.google.gr/maps)

The riparian forests around Lake Trichonida, consist of riparian tree species *Fraxinus-Ulmus*, *Platanus orientalis-Salix alba* in pure or mixed stands. Finally, the understorey's vegetation was dominated by the species *Nerium oleander L*., *Rubus sp, Vitex agnus-castus L., Agrostis vinealis* Schreber. A large part of the climbing vegetation was occupied by *Rubus sp*. and *Hedera helix* L. The riparian forest of Lake Trichonida is dominated by *Platanus* and *Salix* either in pure or mixed stands, which is noticeably shrunken and degraded from mainly the fungus *Ceratocystis fimbriata f. sp. platani*, which was recently identified in the plane forests of the lake (Fig 2 a,b) and due to intense human activities (Stergiannis et al. 2020). According to Stefa (2011), more than 200 species of birds have been observed in Lake Trichonida. The main species of birds are: *Egretta garzetta*, *Anas ptatyrhynchos* etc.

In order to carry out the research, an on-site observation was made and study of the structure of the riparian forest around Lake Trichonida and at the same time research was done to record the opinions of visitors using questionnaires to record the problems of the area.

Figure 2 a.b. Dead plane trees from *Ceratocystis fimbriata f. sp. platani* (photo: P. Stergiannis)

RESULTS AND DISCUSSIONS

The survey recording the problems of the area by the visitors by completing questionnaires. A total of 75 fully completed questionnaires and 5 partially completed ones (were not included in the survey) were collected. About of 62% women and 38% men of the total participated, with ages 31-45 years (42%) and 46-60 years (30%). The 26% of the respondents are university graduates, while 12% had a master's degree and 2% a PhD. The first hierarchical problem identified by 38% of respondents was cleanliness, 32% voluminous waste and 14% stray animals. Cleanliness and bulky waste were recorded by 34% of the visitors as the second hierarchically important problem (table 1). As the third hierarchical problem, incomplete signage was recorded by 24% and insufficient lighting and animal excrement by 18%.

Table 1

Main negative points of Lake Trichonida in percentages

No	Main negative points	1	2	3	4	5	6	7	8	Total %
1	Cleanliness (garbage)	38	34	8	2	2	2	12	2	100
2	Faeces of domestic and stray animals	2	8	18	24	8	14	8	18	100
3	Incomplete signage	4	6	24	22	16	4	24	0	100
4	Garbage (old furniture, cars, junk)	32	34	6	6	2	8	0	12	100
5	Insufficient lighting	6	8	18	6	26	28	8	0	100
6	Inadequate visitor security	2	10	4	24	26	12	20	2	100
7	Existence of stray animals	14	0	8	16	4	22	14	22	100
8	Dense vegetation (bushes) and difficult access	2	0	14	0	16	10	14	44	100

Table 2

Natural and anthropogenic threats of Lake Trichonida

No	Threats	Very	Little	Not at all	Don't Know	Total %
1	Fire	32	48	16	4	100
2	Abandonment	60	32	8	0	100
3	Hunting	22	26	42	10	100
4	Agriculture	10	60	28	2	100
5	Very large number of visitors	0	50	42	8	100
6	Residential development	4	26	50	20	100
7	Industrial development	2	42	48	8	100

The main threats to the lakeside forests are according to the respondents (table 2): abandonment (60%), insufficient management (58%), fire risk (32%) and hunting (22%). The threats that undermine the lake's riparian forests the least are in the opinion of the respondents: agriculture (60%), the large number of visitors (50%), fire (48%), industrial development (42%), abandonment (32%), residential development (26%), hunting (26%).

CONCLUSIONS

In the questionnaire that was brought to the attention of the respondents in the context of this work, and related to the "recording of the main negative elements that locate the coastal areas of Lake Trichonida", the largest percentage of the respondents believe that it concerns "cleanliness and waste", while in last positions, hierarchically, are ranked "the insufficient security of the visitors, the dense vegetation (bushes) and the difficult access".

Finally, the riparian forest vegetation of Lake Trichonida, according to this research, is threatened more by its abandonment and inadequate management, less by industrial and residential development and not at all by visitors. These opinions,

of those interviewed, are deemed appropriate to be taken into account by the competent services, so that the appropriate actions contribute to the protection of the riparian vegetation and, in general, to the sustainable development of the wider area of Lake Trichonida.

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