

Temporal analysis of free-ranging cows' movement on wet grasslands of Axios Delta in Greece

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Wet meadows are covered by characteristic plant communities composed of species adapted to periodically flooded soils along the river.

Despite their limited extent, they constitute valuable habitats for the wild flora and fauna and important resource for extensive animal husbandry as well.



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Grazing in the riparian ecosystems

Grazing of free-ranging cattle is a traditional management practice suitable for wet meadows for the following reasons:

- constant supply of freshwater,
- high forage productivity even during the dry summer periods and
- flat terrains



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Grazing in the riparian ecosystems

Livestock grazing directly impacts:

- riparian vegetation,
- ground cover and soils through plant consumption,
- nutrient addition and
- Trampling

Indirectly impacts:

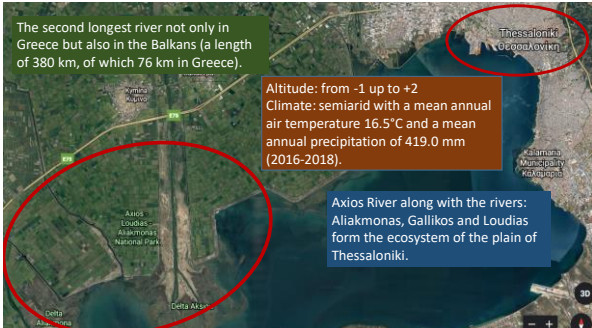
- plant communities (i.e exotic plant species invasion)
- altered nutrient cycling and water quality
- fauna habitat



The second longest river not only in Greece but also in the Balkans (a length of 380 km, of which 76 km in Greece).


Altitude: from -1 up to +2
Climate: semiarid with a mean annual air temperature 16.5°C and a mean annual precipitation of 419.0 mm (2016-2018).

Axios River along with the rivers: Aliakmonas, Gallikos and Loudias form the ecosystem of the plain of Thessaloniki.



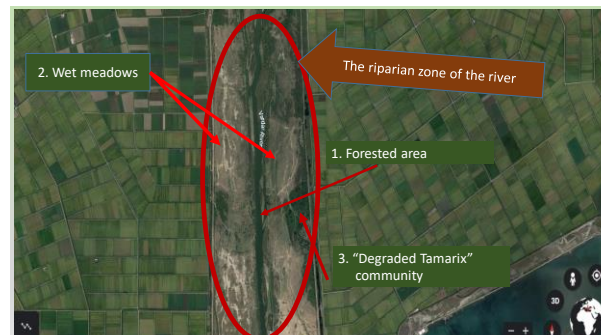
The main tree species in the wider protected region of the study area:

Tamarix sp.
Salix sp.
Alnus glutinosa
Populus nigra
Fraxinus sp.
Platanus orientalis





Source: Thessaloniki Gulf Protected Areas Management Authority

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Axios River is directly associated with livestock husbandry, as the entire area close to the river is grazed by livestock for many decades.

The area is grazed mainly by cattle and few semi-wild horses – About 400 free-ranging cattle graze in the area

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Vegetation types (Natura 2000)

The study area is covered by two vegetation types of European Community Interest (Council Directive 92/43/EEC):

- i) **1420 Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)**
- ii) **92D0 Southern riparian galleries and thickets (*Nerio-Tamaricetea* and *Securinegion tinctoriae*)**

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- The objective of the present study was to investigate the temporal movement of cattle in Axios Delta for two consecutive years (2016-2017).

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- Five different suckling cows, young at age (4-6 years old) were chosen each season and year [5 cows x 3 seasons x 2 years = 30 cows].
- Their grazing behaviour was investigated by mounting these cows with GPS collars (Lotek) around their necks, which in turn recorded their tracks per six minutes on a 24-hour basis during three seasons (spring, summer and autumn).
- Differences in animal movement among the three seasons per year were tested by one way ANOVA and the means by the LSD test ($P \leq 0,05$).



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- As a result, suckling cows' movement was significantly differed among seasons and years concerning the maximum distance that they traveled as well as regarding the spatial distribution (Figure 1 and 2).





In 2016, the mean traveling distance of lactating beef cows was higher in spring and it was being reduced from season to season while the spatial distribution was being increased.

These differences were due to different forage availability from season to season.

Figure 1: Spring (top left), Summer (top right) and Autumn (bottom middle) 2016



In 2017, the mean traveling distance of lactating beef cows was higher in spring and summer compared to autumn. Also, the spatial distribution was being increased from season to season.

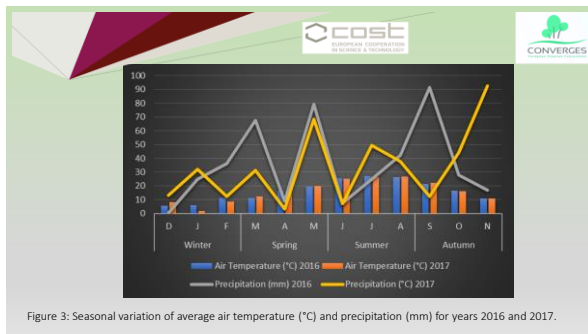
These differences were due to different forage availability from season to season. In general, the year 2017 was drier than 2016.

Figure 2: Spring (top left), Summer (top right) and Autumn (bottom middle) 2017

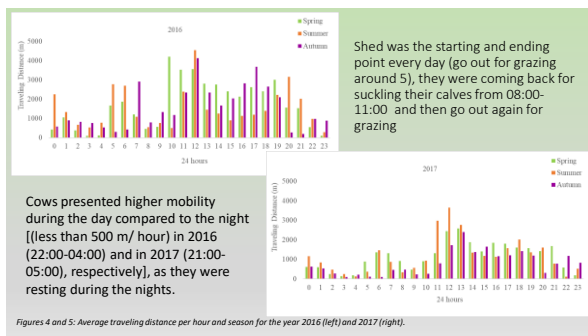
Table 1. Mean diurnal distance of free-ranging cattle per season and year

Years	2016			2017		
Seasons	Spring	Summer	Autumn	Spring	Summer	Autumn
Mean distance (Km)	8.2a ¹	7.4b	7.3c	5.6b	5.7a	4.7c

¹ Different letters in the same line between seasons in each year indicate significant differences ($P < 0.05$)



- In general, shorter distances were observed in 2017 compared to 2016 (Table 1). These differences could be attributed to the fact that lactating cows were grazing mainly in riparian areas, where they preferred grasses, legumes and forbs in contrast to the rest of the delta, where they preferred only halophytes, due to the minimal rainfall that occurred in 2017 (Figure 3).
- It is pointed out that the daily diet of the cows was enriched with supplementary food in the shed in spring of 2017 because of the limited forage.
- In particular lactating cows have greater requirements for more nutritive forage and therefore they are more selective in their diet, not to mention their greater requirements for water due to their special status (lactation period).



Conclusions

- The daily distances were quite great in Axios Delta, as they were affected by the forage availability, which was depended on grazing season and the climatic conditions per year.
- Cows presented higher mobility during the day compared to the night. Time of starting and ending grazing varied according to the season and the year as well.

The results of the present study could be a valuable tool for the sustainable management of this riparian ecosystem.

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