CLIMATE CHANGE AND THE EMERGENCY OF INFECTIOUS DISEASES IN THE EUROPEAN ALPINE ECOSYSTEM

Gemma Serrano Simon
Final Degree Project (June 2022)

OBJECTIVES

Investigating the evidence documented to date on emerging diseases in the European alpine ecosystem and finding out if it can be attibuted to climate change.

I. ricinus
2500 m (ET)

***Culex* spp.**
2100 m

D. reticulatus
1100 m (Cfb)

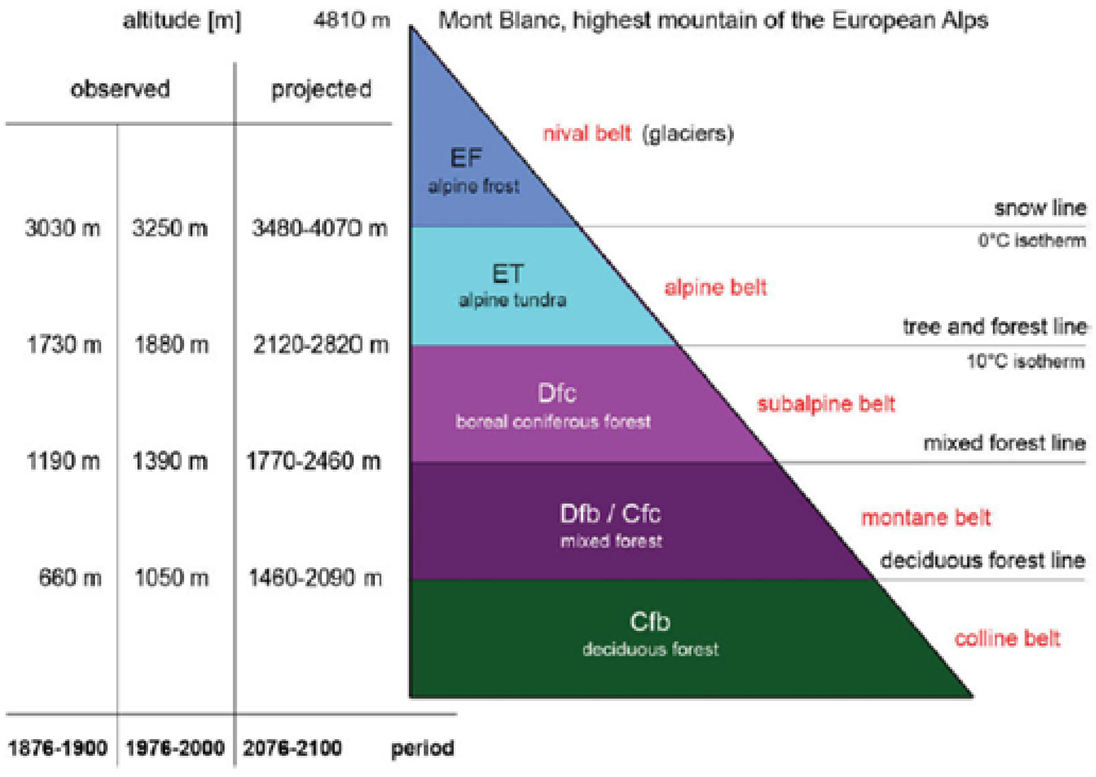

Figure 1. Climate classification of Köppen-Geiger (Rubel et al., 2017)

Figure 2. European Alpine regions (Sundseth, 2010)

DISEASE	PATHOGEN	VECTOR
Lyme disease	*Borrelia burgdorferi* s.l.	*Ixodes ricinus*
Tick-borne relapsing fever (TBRF)	*B. miyamatoi*	*I. ricinus*
Anaplasmosis	*Anaplasma phagocytophilum*	*I. ricinus, I.trianguliceps*
Mediterranean spotted fever	*Rickettsia* conorii	*Riphicephalus sanguineus*
TIBOLA*	*R. slovaca*	*Dermacentor marginatus*
Babesiosis	*Babesia microti*	*R. sanguineus*
Bartonellosis	*Bartonella* spp.	*I. ricinus*
Tularemia	*Francisella tularensis*	*Ixodes* spp. *Dermacentor* spp.
Omsk haemorrhagic fever	Omsk haemorrhagic fever virus	*Dermacentor* spp.
Crimean-Congo haemorrhagic fever	Crimean-Congo haemorrhagic fever virus	*Hyalomma marginatum*
Tick-borne encefalitis (TBE)	Tick-borne encefalitis virus (TBEV)	*I. ricinus, D. reticulatus, D.marginatus*
Tahyna virus disease	Tahyna virus (TAHV)	*Culex pipiens/torrentium*
West Nile fever	West Nile fever virus (WNV)	*A. japonicus, C. pipiens/torrentium*
Bluetongue disease	Bluetongue virus (BTV)	*C. p. pipiens C. torrentium C. obsoletum C. grisescens*
Schmallenberg disease	Schmallenberg virus	*C. obsoletum*
Dirofilariosis	*Dirofilaria repens/immitis*	*Aedes* spp. *Anopheles* spp.
Malaria	*Plasmodium* spp.	*A. petragnani*
Leishmaniasis	*Leishmania infantum*	*Phlebotomus perniciosus*

Taula 1. List of pathogens found in circulating vectors, along with the disease they may cause or of which cases have already been found in humans or animals in European alpine regions (in red). *TIBOLA (tick-borne lymphadenopathy)

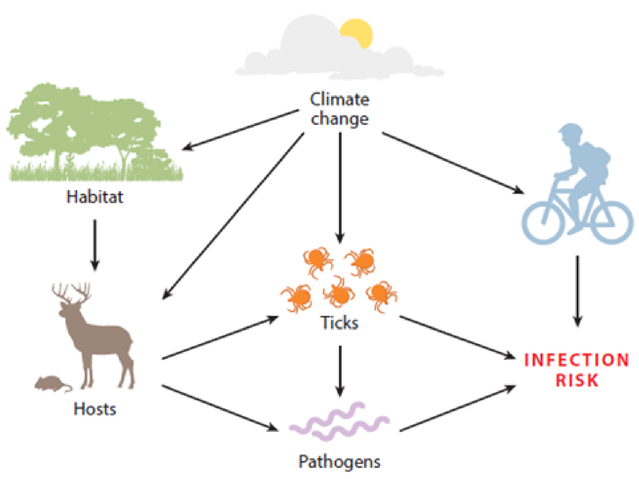

Figure 3. Schematic diagram showing how climate change can affect ticks directly or indirectly (Gilbert, 2021)

CONCLUSIONS

There has been an expansion of vectors, pathogens and their diseases to northern latitudes and upper altituds of Europe, spreading also to alpine ecosystems.

Climate change is making the european alpine ecosystem more suitable for the emergency of diseases but a direct attribution is yet controversial due to the participation of other factors.

REFERENCES

Gilbert, L. (2021). The Impacts of Climate Change on Ticks and Tick-Borne Disease Risk. https://doi.org/10.1146/annurev-ento-052720
Rubel, F., Brugger, K., Haslinger, K., & Auer, I. (2017). The climate of the European Alps: Shift of very high resolution Köppen-Geiger climate zones 1800-2100. Meteorologische Zeitschrift, 26(2), 115–125. https://doi.org/10.1127/metz/2016/0816
Sundseth, K. (2010). Natura 2000 en la región alpina. Comisión Europea. Dirección General del Medio Ambiente. http://doi.org/10.2779/74993