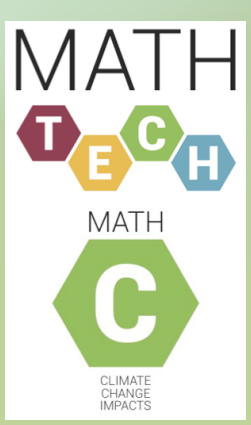
# MATHEMATICAL APPROACH TO CLIMATE CHANGE IMPACTS

## INdAM Workshop 2017

## Book of Abstracts



# MATHEMATICAL APPROACH TO CLIMATE CHANGE IMPACTS

## INdAM Workshop 2017 Rome, March 13 – 17

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# Mathematical tools for controlling invasive species in Protected Areas

D. Lacitignola, F. Diele, F. Casella, C. Marangi, A. Martiradonna & A. Provenzale.

A challenging task in the management of Protected Area is to control the spreading of invasive species, either floristic or faunistic [1], and the preservation of indigenous endangered species, tipically competing for the use of resources in a fragmented habitat. We review two cases of control strategies [2,3] on the wolf-wild boar populations in a Southern Italy Protected Area belonging to the Natura 2000 network. In our case, the challenge for the regional authorities is to plan conservation policies able to maintain the population of wolves while limiting, at the same time, the presence of wild boars, here considered as an invasive species, because of their negative impact on agriculture. The first control strategy reviewed [2] consider the impact of control policies on predator-prey dynamics in fragmented habitats by simulating different dynamical scenarios theoretically analysed with the aggregation method. The key warning from the model is that a very careful combination of control - through proper planning programs - and migration processes among patches of habitats - through the existence of suitable ecological corridors - must be used in order to properly limit the wild-boar population while preserving wolves from extinction. A further model [3] has been developed to apply the Z-control approach to a generalized predator-prey system and consider the specific case of indirect control of the prey (invasive) population. The key role of the design parameter of the model for the successful application of the method is stressed and critical values of the design parameter are found, delimiting the parameter range for the effectiveness of the Z-method. A further development is to optimize the control strategy by taking into account the spatio-temporal features of the invasive species control problems over large and irregular environments. The approach will be used in a management scenario where the invasive species to be controlled with an optimal allocation or resources is the *Ailanthus altissima,* infesting the Alta Murgia National Park, study site of an on-going H2020 project (ECOPOTENTIAL). This species is included in the top 20 list of the most invasive species in Europe and its eradication and spread control is object of research projects and biodiversity conservation actions in both protected and urban areas [4].

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