Online Advanced Course
MEDITERRANEAN FOREST HEALTH IN THE CONTEXT OF GLOBAL CHANGE
22 November – 1 December 2021

PROGRAMME

1. **Mediterranean forest and global change (1 hour)** (I. Martínez de Arano)
   - 1.1. Forest and society: products and other ecosystem services, public health
   - 1.2. Forest sector role in bioeconomy
   - 1.3. The concept of forest health
   - 1.4. History of Mediterranean forests and forest health
   - 1.5. Global change and Mediterranean forest
     - 1.5.1. Climate change in the Mediterranean basin
     - 1.5.2. Interactions with native pests/diseases
     - 1.5.3. Invasive species
     - 1.5.4. Land use change and habitat loss
2. **Direct and indirect effects of climate change on forest health (10 hours)**
   - 2.1. Climate change scenarios for Mediterranean forests (2.1 and 2.2: 2 h) (J.J. Camarero)
   - 2.2. Abiotic drivers (J.J. Camarero)
     - 2.2.1. Increasing temperature and heat waves
     - 2.2.2. Rainfall variation regimes and drought
     - 2.2.3. Fire
     - 2.2.4. Air pollution
     - 2.2.5. Phenological shift
   - 2.3. Biotic drivers
     - 2.3.1. Climate envelope/expansion/regression
       - 2.3.1.1. Prediction based on species distribution models (SDM) – The case of *Phytophthora cinnamomi* (1 h) (B. Marçais)
       - 2.3.1.2. Mechanistic models – The case of *Thaumetopoea pityocampa* (1 h) (A. Battisti)
       - 2.3.1.3. Demonstration exercise using SDM and degree-days (2 h) (A. Battisti)
     - 2.3.2. Drought/parasites interaction
       - 2.3.2.1. The case of *Diplodia sapinea* (1 h) (B. Marçais)
       - 2.3.2.2. The case of wood borers and bark beetles (1 h) (M. Branco)
       - 2.3.2.3. Phenological shifts – The case of gypsy moth in Sardinia (A. Battisti)
     - 2.3.3. Response of natural enemies (1 h) (A. Farinha)
   - 2.4. Tree decline – The case of oaks (1 h) (A. Solla)
3. **Non-native pests (8 hours)**
   - 3.1. History and pathways (1 h) (A. Roques)
   - 3.2. Detailed case studies of invasive pests and diseases in the Mediterranean region
     - 3.2.1. Insects: *Leptoglossus* seed bugs, *Xylosandrus* spp. ambrosia beetles, recent changes in eucalypt insect invaders (3.2.1 and 3.2.2: 2 h) (M. Branco, A. Roques)
     - 3.2.2. Nematodes – The case of pine wood nematodes (P. Naves)
     - 3.2.3. Pathogens: *Phytophthora cinnamomi*, *Cryphonectria parasitica, Fusarium circinatum* (1 h) (B. Marçais)
     - 3.2.4. Invasive plant species (1 h) (H. Marchante)
   - 3.3. Methods for predicting new invaders (1 h) (A. Roques)
     - 3.3.1. Tools presentation
     - 3.3.2. Demonstration exercise on horizon scanning for predicting biological invasions
   - 3.4. Regulation of quarantine organisms (1 h) (A. Battisti)
   - 3.5. Detection and management (1 h) (M. Faccoli)

4. **Forest health surveillance (7 hours)**
    - 4.1. Principles and methods of existing monitoring and surveillance programmes (4 h) (M. Ferretti)
        - 4.1.1. Survey methods
        - 4.1.2. Tree and forest health indicators (visual and non-visual); assessing forest health status and trends
        - 4.1.3. The case of the ICP Forests
        - 4.1.4. Practical work (M. Ferretti, N. Potočić, E. Gottardini)
            - 4.1.4.1. Tree defoliation
            - 4.1.4.2. Visible foliar symptoms due to ozone
    - 4.2. Need for improved surveillance and methods
        - 4.2.1. Diagnosis of invasive species (4.2.1 and 4.2.2: 1 h) (A. Pérez-Sierra)
        - 4.2.2. Surveillance of nurseries and pathways (A. Pérez-Sierra)
        - 4.2.3. New tools for surveillance: remote sensing, GIS, smart traps, etc. (1 h) (D. Rassati)
    - 4.3. Demonstration exercise on the use of online tools and databases (1 h) (D. Rassati)
5. **Management strategies to cope with the effects of global change on forest health (5 hours)**
    - 5.1. Introduction to management strategies (1 h) (A. Solla, M. Ferretti, K. Ipekdal)
        - 5.1.1. Forest health as key criterion of Sustainable Forest Management
        - 5.1.2. Prevention measures
        - 5.1.3. Quarantine and legal restrictions of movement
        - 5.1.4. Silvicultural practices
        - 5.1.5. Biological control
        - 5.1.6. Breeding for tolerance and resistance
    - 5.2. The case of pine wood nematode in Portugal (1 h) (J.M. Rodrigues)
    - 5.3. The case of evergreen oak decline in Spain (1 h) (A. Solla)
    - 5.4. The case of chestnut gall wasp in Turkey. Demonstration on biological control effectiveness simulations (1 h) (K. Ipekdal)
    - 5.5. Debate on current issues in forest health strategies (1 h) (I. Martínez de Arano, A. Solla, M. Ferretti, K. Ipekdal)