

Session 5 – Conservation issues and biological invasions

### **MULTIPLE INVASIONS, ECOLOGICAL OPPORTUNISM AND EFFECTS ON POND BIODIVERSITY OF A MAJOR AMPHIBIAN INVADER, THE MARSH FROG**

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Amphibians are declining globally but some species contrast in expanding and invading broad-scale areas after introductions. Whereas some of these biological invasions have been well documented, such as in cane toads, others, more cryptic, are often underestimated despite multiple local warnings. This is the case of marsh frogs, a group of *Pelophylax* water frogs, for which there is a lack of an integrative overview of their invasion patterns, ecology and risks to biodiversity. To fill this gap, we carried out an inter-disciplinary study in phylogenetics, spatial, trophic and thermal ecology. We found out that introductions involved dozens of localities and many lineages, originating from three continents, fitting well with the history of importations of live frogs in Europe. They gave rise to nation-wide invasions, facilitated by the wide ecological tolerance of marsh frogs and resulting in large spatial niche overlaps with native amphibians. The establishment of the invaders was facilitated by their wide thermal tolerance and optima for high temperatures in a context of global warming. In invaded pond environments, alien marsh frogs showed a high trophic opportunism, preying on most native amphibians but also on many invertebrate taxa. Although the composition of freshwater communities was not globally altered across density gradients of marsh frogs, the invaders preyed heavily on some key predatory taxa and may particularly threaten vulnerable species such as tree frogs. Altogether, these results rank the marsh frogs as one of the most complex and opportunistic invasive amphibian species in the world. They call for the conservation of vegetated ponds to buffer the impact of invaders as well as a complete commercial ban on importation of live water frog to prevent the opening of the Pandora box which may result from the combinations of multiple lineages in invaded territories.

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