

# PhD thesis (3 years) at Angers University

The role of the *Ammonia tepida* species complex  
in coastal ecosystems of the eastern Atlantic margin

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Coastal mudflats are highly complex ecosystems, strongly impacted by human activities. Today, the complex interplays between the controlling environmental and anthropogenic parameters are still poorly understood, explaining the absence of reliable bio-indicator methods of the quality of these ecosystems.

Among the foraminiferal communities, which are major actors in these ecosystems, representatives of the genus *Ammonia* are often dominant. About 15 different genotypes have been distinguished in this genus. On the Atlantic margin, our previous research (CNRS INSU project AMTEP) shows the presence of three genotypes, which are all morphologically close to, and are usually determined as *A. tepida*. By using a morphometric approach, we have been found subtle differences between these genotypes, notably concerning the size and density of the pores. On the basis of these morphological differences, we have been able to show in sediment cores that on the eastern Atlantic margin, a genotype originating from eastern Asia has progressively replaced the autochthonous genotypes, over the past 50 years.

In this context, the proposed 3 years PhD thesis will address several scientific questions:

- What is the recent distribution of the three genotypes? In what types of environmental settings the Asiatic genotype has replaced the autochthonous genotypes, and under what other conditions the autochthonous genotypes have persisted?
- At the sites where the autochthonous and allochthonous genotypes co-occur, do they occupy exactly the same environmental niche? If not, do they occupy different microhabitats, or do they have different nutritional requirements?
- What explains the success of the eastern Asiatic genotype, that occurs today even in some ecosystems that were not inhabited by *Ammonia* previously?
- Do the morphological differences, especially in the pore patterns, translate a different functional morphology, for instance related to gas exchanges, which could explain the success of the eastern Asiatic genotype?
- Are there differences in biodiversity between environments with autochthonous, allochthonous, or a mixture of both genotypes?
- What is the history of the invasion of the eastern Asiatic genotype? What were the vectors of its migration (oyster culture, ballast waters....)? Did it arrive simultaneously on the whole eastern Atlantic margin, or did it progressively disperse from some anthropogenic point sources (harbours, oyster parks)?
- Does the composition of the *Ammonia* assemblages vary in function of environmental quality, and can it be used as a bio-indicator?

These questions will be addressed by a multi-disciplinary approach (ecology, biogeochemistry, morphometry, molecular analysis, micropaleontology, etc.), combining in situ and in vitro observations as well as studies of sediment cores. Finally, this PhD thesis will lead to a better understanding of the role of foraminifera in coastal mudflat ecosystems and may contribute to the development of an adequate biomonitoring method for estuarine environments.

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