

## Ecological footprints of noise associated with maritime traffic on shellfish resources of Saint-Pierre and Miquelon

**Background:** Although previous studies on the anthropogenic impacts on shellfish resources focused mainly on rising seawater temperatures and ocean acidification, recent studies show an important effect of underwater sound on biological processes that might have important consequences on the biodiversity and management of fisheries and aquaculture. Over the last 50 years, maritime traffic has contributed to a 32-fold increase in low-frequency noise in some parts of the ocean, so acoustic studies are becoming an emerging field of research in coastal ecology. Following the decline of cod fishery, significant efforts in Saint-Pierre and Miquelon (SPM) have been made in economic diversification through aquaculture, particularly with sea scallops since the 1980s. Two scallop species, the sea scallop *Placopecten magellanicus* and the Iceland scallop *Chlamys islandica*, occur in SPM. This type of aquaculture is highly dependent on the environmental conditions during each step of the bivalves' complex life cycle, so perturbations may have ecological and economic consequences. Hence, we propose to assess the impact of vessel noise on these bivalves directly in the field.

**Project:** The main objective is to evaluate acoustic impacts on the natural dynamics of scallops (*P. magellanicus* and *C. islandica*) at two contrasting sites, one disturbed and one pristine. Saint-Pierre harbour will constitute the disturbed site because of the anthropic stressors surrounding it; the northeastern part of Miquelon will be considered as the pristine site since ship traffic is negligible. The impact of the soundscape will be evaluated on different stages—larvae and adults—of the scallop populations. Spat collection and recruitment dynamics including larval settlement, metamorphosis success, and growth will be monitored at both sites and locally manipulated by anthropophony (with or without vessel noise) using underwater acoustic speakers. In parallel, detailed characteristics of the pelagic compartment will be determined, including the physical and biotic environments: SPM is subjected to strong thermic oscillations originating from internal waves. Recent results showed that genetically differentiated populations occur in variable and stable environments around SPM, so questions arise on potential genetic differentiation related to exposure to ship traffic. Furthermore, we will test the influence of ship noise on the feeding behaviour of adults using valvometry.



**Perspective:** This Ph.D. project is part of the international and interdisciplinary project “Acoustic impact of ship traffic on mussels and scallops of the Gulf of Saint Lawrence” (AUDITIF), which is part of the BeBEST international laboratory. The anticipated results will increase our understanding of the direct effect of traffic noise perturbations on the life cycle of scallops and the indirect effect on the aquaculture of these species. Results will ultimately help management, so that science-based decisions can be made for the economic development of these resources.

**Additional information and thesis supervision:** [Gesche Winkler](#), Supervisor, and [Réjean Tremblay](#), Co-supervisor.