

Fully-funded PhD position at the Chinese University of Hong Kong, in collaboration with the University of Hong Kong and University of South Australia

**Topic:**

Developing next-generation probiotic marine bacteria for sustainable marine bivalve mollusc aquaculture under climate change

We are seeking an enthusiastic and highly motivated PhD student with interests in both the fundamental and applied aspects of marine microbiology, population biology, symbiosis, and organism responses to global change to join our group. Funding has been secured to support a PhD student for three years for candidates with a Master degree or four years for candidates with a Bachelor degree, with annual studentship of HK\$216,300 (approx. US\$27,730). The project will be jointly supervised by Haiwei Luo ([haiweiluo@cuhk.edu.hk](mailto:haiweiluo@cuhk.edu.hk)) and Laura Falkenberg ([laurafalkenberg@cuhk.edu.hk](mailto:laurafalkenberg@cuhk.edu.hk)) at The Chinese University of Hong Kong (CUHK), and in collaboration with Bayden Russell ([brussell@hku.hk](mailto:brussell@hku.hk)) at The University of Hong Kong (HKU). The PhD student will be primarily based at CUHK, will work at the Simon F.S. Li Marine Science Laboratory of CUHK ([www.msl.sls.cuhk.edu.hk](http://www.msl.sls.cuhk.edu.hk)) and the Swire Institute of Marine Science of HKU ([www.swims.hku.hk](http://www.swims.hku.hk)), and will have the opportunity to perform collaborative work at University of South Australia where a new lab will be established by Laura Falkenberg. CUHK is a long-standing English-speaking institution and ranks as one of the top Universities in Asia.

**Competences:**

The successful candidate will have a Bachelor degree with at least one year of laboratory research experience or a Masters degree in biological sciences. We are seeking a highly motivated candidate with background in microbiology, marine biology, and/or bioinformatics. He/she should have a good work ethic and organisational skills to transition between different work settings (laboratory, mesocosm, field, bioinformatics).

**About the project:**

Probiotics have been extensively used as an alternative to antibiotics in aquaculture to improve growth performance, immune response, disease resistance, and feed efficiency. However, concern exists around safety issues because commercially available probiotics for aquaculture commonly carry virulence genes that may have adverse effects on human health. Despite this concern, few efforts have been made to find alternative probiotics that are free of these risks. Moreover, the efficacy of probiotics – either traditional or emerging – may be modified in the future as a consequence of climate change.

In this project, we aim to identify next-generation probiotic marine bacteria and evaluate their effects on mussels, a representative bivalve mollusc used in aquaculture. Here, next-generation probiotics are defined as autochthonous host-associated bacteria that are increasingly dependent on, and restricted to, the hosts. Although many kinds of bacteria are found associated with mussels, bacterial associates having the hallmarks of early-stage symbiosis have only recently been recognized.

The marine bacterial genus *Ruegeria* is prevalently associated with marine invertebrate hosts. We recently discovered that some *Ruegeria* populations carry the genomic signatures of early symbiosis. During host adaptation, *Ruegeria* members use their own tools (i.e., insertion sequences) to disable and eliminate virulence genes in their genomes, thereby having the potential to become sustainable next-generation probiotics.

**Key words:**

mussel, *Ruegeria*, marine bacteria, population genomics, symbiosis, probiotics, seafood, aquaculture, global change

**Expectation:**

The PhD student will be responsible for the implementation of the practical work of the project, with support from the PIs and their lab members. Specific activities will be to: (1) strategically collect mussels from the field along Hong Kong's coastline and perhaps part of the South Australian coastline from which, (2) the PhD student will extract and build a comprehensive mussel-associated *Ruegeria* culture collection. In the next component, (3) population genomic methods will be used to identify *Ruegeria* populations under early symbiosis with mussels. Following their identification, (4) the mesocosm systems at the Marine Science Laboratory of CUHK and the Swire Institute of Marine Science of HKU will be used to expose mussels to different conditions anticipated under global change scenarios (i.e., warming and acidification), with some of the exposed organisms inoculated with the next-generation probiotics to identify if – and how – they modify the mussel response. The PhD student will also take the lead in drafting manuscripts for publication and present the results at academic conferences.

**Start date:** 1<sup>st</sup> January 2024

**How to apply:**

Please send your application to [haiweiluo@cuhk.edu.hk](mailto:haiweiluo@cuhk.edu.hk) or [laurafalkenberg@cuhk.edu.hk](mailto:laurafalkenberg@cuhk.edu.hk) with "Application PhD mussel-Ruegeria" in the subject line. Applications should include a CV, a cover letter summarizing research interests, and contact information for two references.

**Application deadline:** Review of the applications will start on 1<sup>st</sup> June and continue until the position is filled. The closing date is 15<sup>th</sup> September 2023 for international applicants and 15<sup>th</sup> November 2023 for local applicants.

**Further information:** Please contact [haiweiluo@cuhk.edu.hk](mailto:haiweiluo@cuhk.edu.hk) or [laurafalkenberg@cuhk.edu.hk](mailto:laurafalkenberg@cuhk.edu.hk) with "Application PhD mussel-Ruegeria" in the subject line with any queries or requests for more information about the project, or studying in Hong Kong and at the Chinese University of Hong Kong.