

The Research Group

Ecology and Biodiversity

has the honor to invite you to the public defense of the PhD thesis of

Chaimae El Bouzidi

to obtain the degree of Doctor of Sciences

Title of the PhD thesis:

**Contribution to the biology and population genetics of
the European hake (*Merluccius merluccius*) in the north Atlantic of
Morocco**

Promotors:

Prof. dr. Marc Kochzius (VUB)
Prof. dr. Mounir Hassani Zerrouk (UAE)
Prof. dr. Mohammed Bakkali (UAE)

The defense will take place on
**Saturday, February 11, 2023 at 10h in
the University of Abdelmalek Essaadi
(Morocco)**

<https://meet.google.com/ioa-dnwd-oze>

Members of the jury

Prof. dr. Aksissou Mostapha (UAE, chair)
Prof. dr. Hicham Chairi (UAE, secretary)
Prof. dr. Kristien Brans (VUB)
Prof. dr. Amin Laglaoui (UAE)
Prof. dr. Mustapha Hasnaoui (UMI)
Prof. dr. Taha Rhouda (UH2C)

Curriculum vitae

Chaimae El Bouzidi has an academic background that includes an international study program in Morocco, Switzerland and Belgium. She is specialised in the study of marine resources and has obtained her Master's degree in Marine Environment / Exploitation of Marine Resources at the Abdel Malik Esaadi University of Tangier. She is doing a joint PhD between Abdel Malik Esaadi University and the Vrije Universiteit of Brussel. She has already published an article on a part of her thesis and another article is under review in international peer-reviewed journal.

Abstract of the PhD research

The European hake (*Merluccius merluccius*) is a species of a high commercial value for industrial fisheries in the Atlantic and Mediterranean Sea. Its large geographical distribution makes the European hake a highly targeted fish. In Morocco, the hake fishery is practiced along the Moroccan coast by coastal trawlers, coastal longliners, and traditional small boats. The exploitation of *M. merluccius* in the North Atlantic has been decreasing. The catch-per-unit-effort was 10 kg/30 minutes and has continued to decline to 3.13 kg/30 minutes in 2019, reflecting a high level of exploitation. Several studies have been conducted to investigate the bio-ecology of *M. merluccius*, but gaps still remain, particularly on its biological and genetic aspects. The objective of this PhD project is to contribute to the improvement of the management of the European hake in the North Atlantic of Morocco by investigating its reproduction, growth, diet, and genetic stock structure. One of the important aspects to reach this objective is the determination of the genetic structure of the population from samples collected at the northern Atlantic and Mediterranean coast of Morocco. Additionally, the present study will allow us to enrich the biological knowledge on European hake, especially in Morocco, and to situate the findings with respect to the literature. Biological data were collected monthly during August 2017 to August 2018, from the coastal trawl fishery operating between Asilah and El Jadida and landing at the port of Larache. Samples for genetic analysis of European hake were collected in January 2021 from two sites in the Atlantic and one site in the Mediterranean Sea. The growth study was based on the analysis of monthly size-frequency data and showed positive allometric growth. Histological analysis of the gonads detected one case of hermaphroditism and four cases of intersex gonads. The diet analysis confirms the opportunistic behaviour of European hake and reveals a preference for fish. However, its diet changes according to size and season. The mitochondrial cytochrome oxidase subunit 1 (COI) gene was used to study the genetic structure and connectivity of *M. merluccius* populations from three sites in Morocco (Larache, Kenitra and M'diaq) and 159 sequences from several sites in the Mediterranean and Eastern Atlantic that were downloaded from GenBank and BOLD, obtaining a data set of 270 sequences with 450 base pairs (bp). Thirty-five haplotypes were detected with high genetic diversity (mean: $h = 0.7$). AMOVA of pairwise fixation index Φ_{st} revealed panmixia throughout the study area with high connectivity, except in Izmir Bay where a genetic difference was detected.