



Stazione  
Zoologica  
Anton Dohrn  
Napoli

**Tackling diversity through DNA barcoding and  
integrative taxonomy:  
Decapod Assemblages Revealed IN the Gulf of Naples  
(DARING)**

**Valentina Tanduo**

Thesis submitted for the degree of  
Doctor of Philosophy (PhD) – XXIV cycle

Director of studies:

Dr. Fabio Crocetta

Supervisors:

Dr. Salvatore D'Aniello  
Prof. Rafael Zardoya

Advisor  
Dr. Lucia Rizzo

Open University Milton Keynes (UK)  
School of Life, Health and Chemical Sciences

Stazione Zoologica Anton Dohrn, Naples (Italy)  
Department of Integrative Marine Ecology

September 2025

## **Supervision Panel**

Director of Studies:

Dr. Fabio Crocetta (Stazione Zoologica Anton Dohrn, Naples - Italy)

Supervisors:

Dr. Salvatore D'Aniello (Stazione Zoologica Anton Dohrn, Naples - Italy)

Prof. Rafael Zardoya (Museo Nacional de Ciencias Naturales, Madrid -Spain)

Advisor:

Dr. Lucia Rizzo (Institute of Sciences of Food Production, National Research Council, Lecce-Italy; Stazione Zoologica Anton Dohrn, Naples – Italy)

## **Examination Panel**

External Examiner:

Prof. Christophe Lejeusne (Aix-Marseille University, Marseille - France)

Internal Examiner:

Dr. Gabriele Procaccini (Stazione Zoologica Anton Dohrn, Naples - Italy)

Chair:

Dr. Ylenia Carotenuto (Stazione Zoologica Anton Dohrn, Naples - Italy)

## Abstract

The Mediterranean Sea hosts an extraordinary biodiversity, with the order Decapoda Latreille, 1802 being one of its most diverse and ecologically significant groups. Despite their ecological and economic relevance, the alpha taxonomy of Mediterranean decapods remains incomplete, having relied mainly on morphology. Although DNA barcoding is globally effective for species identification, the Mediterranean decapod fauna still lacks a comprehensive, large-scale barcoding initiative.

This PhD thesis addresses that gap by applying an integrative taxonomic approach (combining morphological and molecular methods) to investigate the alpha diversity of decapods in the Gulf of Naples and nearby (central-western Mediterranean).

**Chapter 2** presents the development of the first barcode reference library for Mediterranean decapods, based on the standard DNA barcode region of the Cytochrome C Oxidase subunit I gene. This foundational effort enabled the initial molecular screening of species, revealing patterns of conspecificity with Atlantic counterparts, as well as indications of putative speciation events and the presence of cryptic species. Building on the initial screening, specific taxa were selected for targeted taxonomic revisions that exemplify standard practices in the field. These case studies aimed to corroborate preliminary single-gene analyses through increasingly sophisticated molecular approaches, including multilocus, complete mitochondrial genome, and phylogenomic methods. Specifically, **Chapter 3** revised the genus *Eurynome* Leach, 1814 within the Atlanto-Mediterranean region, while in **Chapter 4** the taxonomic validity of *Calappa rosea* Jarocki, 1825 was questioned. Finally, in **Chapter 5** a new species was found in the genus *Pilumnus* Leach, 1816.

Therefore, this thesis marks a pioneering effort to reassess the alpha taxonomy of Mediterranean decapods by applying advanced molecular techniques and yields new insights into species distribution and phylogenetic relationships. By refining species boundaries and revealing cryptic diversity, it establishes a robust foundation for future research, informs conservation planning, and supports the sustainable management of marine biodiversity in the region.