



**Międzynarodowa Środowiskowa Szkoła Doktorska**  
przy **Centrum Studiów Polarnych**  
w Uniwersytecie Śląskim w Katowicach

ul. Będzińska 60  
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**Title of PhD project:** Ghosts of the ocean: New insights into the distribution, taxonomy, and biology of siphonophores.

**The leading unit:** Instytut Oceanologii Polskiej Akademii Nauk w Sopocie

**Requirements:**

- 1) Completed master's studies in Oceanography, Marine Biology or related.
- 2) Knowledge of research topics related to gelatinous zooplankton
- 3) Experience in using data from underwater imaging tools and modern methods used in zooplankton studies, in particular in identification of siphonophores
- 4) Knowledge and experience in gelatinous zooplankton identification, including molecular methods
- 5) Ability to process data in statistical programs (e.g., Statistica, Primer, Permanova) and visualize them (e.g., Corel Draw, OceanDataView)
- 6) Experience in scientific cruises
- 7) Experience in working with international teams, for example during international internships
- 8) Experience in presenting results on conferences
- 9) Knowledge of English enabling communication, reading and writing scientific papers.

**Tasks description:**

1. Literature review of the topic, including the meta-analysis of existing data
2. Laboratory analyses of the morphology of Siphonophora
3. Processing and analysing data from underwater cameras, including the application of machine learning
4. Preparation of scientific articles and conference presentations
5. Regular reporting of work progress
6. Assistance in the daily scientific tasks during the realization of the project
7. International collaboration

**Summary of a doctoral project:**

Transparency, is another than size crucial morphological feature, that can potentially bring a lot of new qualitative information about plankton community structuring. Most of



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transparent organisms, despite low dry mass, play important roles in various processes by which organic carbon is produced, stored, utilized and transported towards the sea floor. They are also good indicators of climate-induced shifts in zooplankton communities. However, most of the transparent zooplankton taxa are not efficiently caught by traditional tools, such as nets, and thus require more sophisticated approaches to study, which makes them a widely understudied group. One of the most prominent representative of transparent zooplankton organisms are siphonophores, a group of primarily pelagic, colonial cnidarians, characterized by an unparalleled functional specialization of zooids and unique colony architecture. This however, renders their taxonomic identification particularly difficult and necessitates application of more advanced sampling strategies. Siphonophores are also considered a key component of deep sea trophic webs, thus understanding the intricacies of their distribution is pivotal for understanding the functioning of pelagic ecosystems.

Here underwater imaging will be applied to meet the challenge to investigate the distribution of siphonophores *in situ*. It includes data from the Monterey Bay, both from of the camera mounted on remotely operated vehicles (ROV), as well as from UVP camera mounted on neutrally bouant Argo floats. Moreover, other existing imaging data from various regions will be utilized, along with literature-based repositories to produce both a local, and global synthesis about the distribution of siphonophores. This will include data mining, but also machine learning techniques to process a wealth of images and videos collected.

Laboratory work will include microscope-based detailed morphological examination of physical specimens with the aim to describe a new species, and to thoroughly study microanatomy of siphonophore synapomorphy, pneumatophore, a gas-filled float utilized in buoyancy control and thus responsible of their vertical distribution patterning. Specimens needed for this work are already collected and are either in possession of the project co-supervisor or are available from the Yale Peabody Museum.

The aim of the project oscillates around gathering new knowledge about distribution of siphonophores, their taxonomy and biology.



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**Other information:**

The work will be carried out under supervision of: dr hab. Emilia Trudnowska, prof IOPAN, [emilia@iopan.pl](mailto:emilia@iopan.pl), IOPAN & dr Maciej Mańko, [maciej.manko@ug.edu.pl](mailto:maciej.manko@ug.edu.pl), UG

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