Brackish and anthropogenically modified waters as hotspots of microalgal diversity - The case of Slovenian transitional waters (Adriatic Sea)

Slavinec Petra[1], Fortič Ana[2], Francé Janja[2] and Mozetič Patricija[2]

[1] National Institute of Biology, Marine Biology Station Piran, Slovenia; University of Ljubljana, Biotechnical Faculty, Slovenia, Večna pot 111, 1000 Ljubljana, Slovenia; Jamnikarjeva 101, 1000 Ljubljana, Slovenia
E-mail: petra.slavinec@nib.si

[2] National Institute of Biology, Marine Biology Station Piran, Slovenia, Večna pot 111, 1000 Ljubljana, Slovenia

Transitional waters such as brackish lagoons and estuaries are considered highly productive ecosystems due to the significant enrichment of water with organic matter and nutrients from the land. At the same time, these ecosystems are under intense anthropogenic pressures, which have recently been exacerbated by the effects of climate change. Due to the high variability of environmental parameters and extreme conditions resulting in empty ecological niches, these types of anthropogenically modified environments can provide a favourable environment for the establishment of non-indigenous species (NIS) and their developmental stages.

This is the first study of microalgal diversity in the transitional waters of the Slovenian coast (Adriatic Sea): the Port of Koper located in the river mouth and the brackish coastal lagoon Škocjanski Zatok with 14 and 1 m depth, respectively. Samples were collected once a month from 2018 to 2021 and microalgae were identified using an inverted and a scanning electron microscope. Results were compared with data from LTER site, representing the reference station for monitoring the ecological status of the coastal sea following the Water Framework Directive.

Similarities in the diversity and seasonal occurrence of microalgae between transitional waters and LTER marine site were estimated. Microalgal diversity was higher in brackish transitional waters (284 taxa) than in the adjacent coastal sea (153 taxa) because brackish waters harbour more salt-tolerant species. In addition, 35 taxa were detected for the first time in Slovenian transitional waters. We found three taxa that can be classified either as cryptogenic (*Azadinium caudatum* cf. *margalefii* and *Merismopedia* sp.) or as NIS (*Pseudo-nitzschia multistriata*). In addition to the latter, some newly found species can also be considered potentially toxic (*Coolia monotis, Anabaena* sp. and *Lyngbya* sp.). In terms of seasonality, both transitional waters and LTER marine site showed seasonal patterns in the distribution of microalgal groups, although these patterns were more pronounced and evident in the transitional waters.

References

- European Communities. 2000. Directive 2000/60/EC of the European parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. Official Journal of the European Communities 43 (L327): 75.
- Gómez F. 2003. Checklist of Mediterranean free-living dinoflagellates. Botanica Marina. *doi: 10.1515/BOT.2003.021*
- Lassus P., *et al.* 2016. Toxic and Harmful Microalgae of the World Ocean. Denmark, International Society for the Study of Harmful Algae in United Nations Educational, Scientific and Cultural Organisation.
- Mozetič P., Cangini M., *et al.* 2019. Phytoplankton diversity in Adriatic ports: Lessons from the port baseline survey for the management of harmful algal species. Marine Pollution Bulletin. *doi: 10.1016/j.marpolbul.2017.12.029*

Keywords
Microalgae; Diversity; Coastal Sea; Brackish Waters; Transitional Waters; Non-Indigenous Species