Theme Session I
The increasing importance of biofouling for marine invasions: an ecosystem altering mechanism

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The number, diversity and size of various anthropogenic hard structures in marine environments, whether moving (e.g. ships or rigs, floating buoys including aquaculture devices) or fixed (e.g. coastal defence and harbour works, windmill farms) are rapidly increasing worldwide. Biofouling is of growing concern in the IMO and non-indigenous species introduced by human activities is of relevance to various EU strategies (biodiversity and invasive species strategy) and legislation e.g. the Marine Strategy Framework Directive.

The growing presence of artificial structures is not only clearly visible in coastal-zones that are becoming hardened for centuries. Lately, artificial hard substrata such as those for renewable energy projects or used by the gas and oil industry are introduced to the offshore environment. This is in addition to expanding shipping activities, already recognized as an important vector for species movement. Nowadays, the increased availability of man-made structures in the marine environment poses a concern, but the decommissioning of many of these structures when becoming obsolete poses questions to future managerial issues. For example, do structures such as rigs and windmills have to be completely dismantled to reduce the risk of a continued support of non-indigenous species or may the benefits of enriched biodiversity be considered an acceptable trade-off? Also the effects of the TBT ban are becoming more and more evident in the amount of biofouling on commercial ships and other marine structures. A better understanding of the potential risks associated with marine non-indigenous species dispersion because of biofouling in general and the TBT ban specifically is needed to complement existing efforts on ballast water regulation.

Biofouling communities and especially macro fouling communities on artificial substrata usually consist of a selection of hard substratum species. The increased availability of man-made hard substrata, together with the increased activities of vectors such as shipping allows not only a much faster and more intense transport of certain species all over the globe but the migrants now find additional and more suitable habitats to settle and to survive in regions beyond their native range. This not only enhances their distribution and strengthens their strategic position but the presence of a large number of non-native organisms - both spreading and introduced species - has already resulted in major changes to coastal habitats. It has been argued that the newcomers may augment local biodiversity. However, it becomes more and more evident that these non-native species impose a burden on native biodiversity: they alter local communities and there are many unwanted ecological and economic impacts, including those on shipping and aquaculture (e.g. competition, clogging nets).

This session is a joint initiative between ICES Working Groups WGITMO and WGBOSV and the PICES working group on Non-indigenous Aquatic Species (WG21).

We particularly welcome contributions on the following topics:

- New developments in non-native species issues associated with biofouling of artificial structures in the marine environment and other hard substrata like mariculture, shipping and recreational boating;
- Case-studies showing how economic activities relate to invasions, the ecological effects in the marine environment, and whether biodiversity arguments facilitate artificial structures in the marine environment as artificial reefs;
- Development of sustainable technologies and their impact on marine ecosystems, in particular for introductions of non-indigenous species;
- Case-studies showing the effects of the ban of TBT as antifouling paint in the marine environment with respect to biofouling;
- Existing and novel approaches to monitor biofouling on hard substrata, or to characterize risk associated with the multifunctional use of artificial structures