

Master of Science

Course **ISATEC**



The Effect of tourism on benthic introduced species in the Galapagos Marine Reserve

Jonas Letschert

1st supervisor : Prof. Dr. Matthias Wolff

2nd supervisor : PD Dr. Hauke Reuter

Field supervisor: PhD Inti Keith

Bremen, August 2017



Abstract

Marine non-indigenous species (NIS) threaten global biodiversity, as they outcompete native species. The amount of human-mediated marine introductions is growing with global change, mainly due to increased ship traffic. Established NIS are often associated with negative effects for the native communities, and eradications are rarely successful. Marine reserves are no exception and findings about invaded marine protected areas have accumulated in the last decades. Intense marine tourism in reserves has been found to enhance the risk of local NIS dispersal, as it disturbs native communities and increases the number of potential vectors. This study investigated the interaction between marine tourism and abundance of sessile NIS in the Galapagos Marine Reserve (GMR), Ecuador. Settlement plates and dive surveys were used to assess fouling assemblages in different management zones of the GMR, and data were analyzed using multivariate statistics, such as permanova and ordinations. Anthropogenic influence at study sites was quantified by inspecting a 4 year-long data set about ship positions, provided by the Galapagos National Park. Settlement plate communities in tourism and conservation zones differed up to 62% and the factor Zone itself was significant, explaining 14% of variance. Cryptogenic and non-indigenous species were more abundant in settlement plate communities at marine visitor sites, and one new species record for Galapagos, the barnacle *Amphibalanus variegatus*, was found. No such difference between zones was found for sessile communities on natural substrate. Upwelling and the presence of benthic pickers confounded anthropogenic influence on settlement plate communities, and similar future studies should consider to monitor additional abiotic factors, such as water flow and turbidity. This was the first study of its kind in Galapagos, and findings comply with many others that found a positive correlation between marine tourism and abundance of NIS. In marine reserves, more awareness should be raised about invasive species threatening to erode conservation efforts, and management rules preventing NIS dispersal by tourism should be developed.