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Master Thesis Defense

Entitled

*THE CHARACTERIZATION OF HEAVY METALS IN THE DIET OF SOCOTRA CORMORANTS
(PHALACROCORAX NIGROGULARIS) IN THE UNITED ARAB EMIRATES*

by

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Abstract

This study was performed to measure the bioaccumulation of 21 heavy metals (Al, As, Cd, Co, Cr, Cu, Fe, Mn, Mo, Ni, P, Pb, V, Zn, Ca, K, Na, Mg, S, Sr, and Hg) in the liver, gastrointestinal tract (GI) and muscles of one hundred and five samples of Indian anchovy (*Stolephorus indicus*) purchased from local fisherman at the three main study areas: Ajman, Sharjah, Umm Al Quwain in UAE. The main objective of this study was to evaluate the heavy metals concentration in the muscle, liver and gastrointestinal tract (GI) of Indian anchovy, as well as variations depending on the study areas (AJ, SH, UAQ), to compare the level of heavy metals with conducted limits by international guidelines, to investigate the effect of heavy metals on the biomass of Indian anchovy and understand the heavy metal distribution in Socotra cormorant (*Phalacrocorax nigrogularis*). The Varian 710-ES (Agilent 710 Series ICP-OES) system was used for simultaneous determination of heavy metals (Al, As, Cd, Co, Cr, Cu, Fe, Mn, Mo, Ni, P, Pb, V, Zn, Ca, K, Na, Mg, S, Sr) in the liver, gastrointestinal digestive tract and muscle of *Stolephorus indicus*. To study Hg concentration, simultaneous axial view Varian SpectrAA 220FS, coupled to an on-line continuous vapor generation system (Varian, model VGA-77) was used. Some metals showed the significance of the model to discriminate between study areas. The level of heavy metals varied significantly among tissues of fish. As expected, liver possessed the highest concentration of all metals. The metals Fe, Zn, Cu, Cr and Cd in liver and GI were exceeding the maximum permissible limit recommended by international guidelines. Cd was also found in the edible part (muscle) of *Stolephorus indicus* from Ajman and Umm Al Quwain with the concentration slightly exceeding the maximum permissible level established by EC (2005). Thus, the potential danger may emerge in the future, depending on domestic wastewaters and industrial activities in the region. Therefore, further monitoring programs should be conducted to provide spatial and temporal distribution of heavy metals in the Arabian Gulf.

Keywords: Heavy metals, Arabian Gulf, Accumulation, Fish, Tissues, *Stolephorus indicus*, *Phalacrocorax nigrogularis*.