Title: Anthropogenic contaminants in Queensland's coastal dolphins; levels and toxicological effects

Daniele Cagnazzi, Postdoctoral Research Fellow. Marine Ecology Research Centre
Southern Cross University Whale Research Centre

We collected a total of 72 samples of inshore dolphins species from Keppel Bay, Gladstone and Repulse Bay, of which only 66 were of the minimum size required for this project. Of the 66 samples analysed 27 were from humpback dolphins (Keppel Bay = 12, Gladstone = 11, Repulse Bay = 4), 26 from snubfin dolphins (Keppel Bay = 11, Repulse Bay = 15) and 13 bottlenose dolphins from Keppel Bay.

The cytochromes 1A1 and 2B were detected in 63 samples. Overall no significant difference was found in Cyp1A1 and Cyp 2B induction among species (Cyp1A1: $p = 0.2$; Cyp 2B: $p = 0.1$). Significance difference in Cyp1A1 and Cyp 2B induction was found among regions (Cyp1A1: $p = 0.03$; Cyp 2B: $p = 0$). A subsequent post hoc test showed that both Cyp1A1 and Cyp2B induction was significant higher in Gladstone followed by the Fitzroy River and Repulse Bay.

PAHs level were detected in 64 samples. Overall no significant difference was found between sexes in both total and cancerogenic PAHs levels (Tot PAHs: $p = 0.6$; C. PAHs: $p = 0.12$) and neither in total and cancerogenic PAHs levels among species (Tot PAHs: $p = 0.01$; Can PAHs: $p = 0.37$). On contrary significance difference was found in total and cancerogenic PAHs levels among regions (Tot PAHs: $p = 0.02$; Can PAHs: $p = 0.04$). PAHs levels were significantly higher in Gladstone followed by the Fitzroy River and Repulse Bay.

PCBs and DDTS were detected for 64 samples, while HCBs were below the detectable level in 48 samples of the 66 samples quantified. No significant difference was found between sexes in both DDTs and PCBs levels (DDTs: $p = 0.9$; PCBs: $p = 0.39$). Significance differences in PCBs and DDTs levels were found among regions (DDTs: $p = 0.03$; PCBs: $p = 0.04$). PCBs and DDTs values were significantly higher in Gladstone than in Keppel Bay and Repulse Bay.

Of particular concern are the high PAHs level recorded in this study. Total PAHs concentration from Gladstone, Keppel Bay and Repulse BAY were higher than Total PAHs concentration recorded in humpback dolphins from highly polluted regions such as Hong Kong, Xiamen and Zhuhai, in southern China (Leung et al. 2005). Similarly total carcinogenic PAHs in Gladstone samples were higher compared to and Zhuhai, while carcinogenic PAHs value from Repulse Bay and Keppel were higher than Hong Kong and Zhuhai but lower than Xiamen.

Organochlorines levels found in samples from Queensland were compared with the concentrations of HCBs, DDTs and PCBs in other marine mammals, which showed adverse effects. Concentrations of DDTs and HCBs were found at levels not considered dangerous to dolphin's health. Concentrations of PCBs in all samples from Gladstone and in few samples from Keppel Bay were within the range where there may be impairment of reproduction as well as suppression of the immune system (Ramu et al 2005).

In conclusion the presence of a higher ''toxicological stress" in the Gladstone population compared to Keppel Bay and Repulse Bay is highlighted by warning signals such as the

significantly higher CYP1A1 and CYP2B induction. On the other hand, high induction of CYP1A1 CYP2B has been also found in samples collected from the Fitzroy River the site with medium-low human impact compared to *Tursiops truncatus* from the highly polluted Mediterranean Sea. Moreover, particular concern arises from the high levels of HPAs and PCBs found in Gladstone and Keppel Bay specimens