ORGANOCHLORINES IN BLUBBER OF MARINE TUCUXI DOLPHIN, *Sotalia guianensis*, FROM RIO DE JANEIRO COASTAL BAYS, BRAZIL.

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Introduction

Brazil is one of the most industrialized countries in South America and presents some extremely polluted environments. However, few studies have been conducted about organochlorine contamination in Brazilian waters, specially concerning cetacean contamination[1,2,3].

The fact that cetaceans are long-lived top marine predators, presenting large lipid reserves in proportion to their body size, makes them the ideal repository for high concentrations of lipohilic chlorinated hydrocarbons[4]. Hence, they can integrate both temporal and spatial variations on environmental contamination [5].

Marine tucuxi dolphins (*Sotalia guianensis* Gervais, 1853) are small delphinids that inhabit coastal waters in South and Central America, from southern Brazil to Nicaragua, with possible records from Honduras[6]. These marine mammals occur in estuarine areas, bays and inlets and, along Brazilian coast, the species presents high residence patterns in estuaries like Guanabara, Sepetiba and Ilha Grande bays[7].

The drainage basins of the quoted bays concentrate a population of more than 10 million people and thousands of industries. Despite this figures, only two studies were conducted regarding organochlorine concentrations in the biota of the estuaries mentioned [8,9] and both concerned just Guanabara Bay.

This study presents some preliminary results of a great effort to comprise organochlorine bioaccumulation in dolphins of Rio de Janeiro State coast.

Material and Methods

Blubber samples of eight males of marine tucuxi dolphin were collected from specimens incidentally captured in fishing operations and stranded on Rio de Janeiro State.

The samples were excised from the left lateral region below to the dorsal fin. After dissection, all samples were wrapped in aluminum foil and preserved at - 20ºC, until the moment of the analysis[10].

Aliquots of approximately 1,0 g of blubber were homogenized with anhydrous Na_2SO_4 and extracted by continuous Soxhlet apparatus, using a soxhlet for 8 hours with a mixture of hexane: dichloromethane (1:1). An aliquot (1mL) was mixed with sulfuric acid for the clean-up. After centrifugation and phase separation, an internal standard (octachloronaphtalene) was added for the quantification. The lipid content was measured gravimetrically.

A Shimadzu Gas Chromatographer-14B with a ^{63}Ni electron capture detector (ECD) was used in the analysis. Organochlorine concentrations are expressed as $mg.kg^{-1}$ calculated on a lipids basis.

The analytical method was validated using a standard certified material (Cod Liver Oil – SRM-1588, National Institute of Standards and Technology – NIST). The accuracy of the method was even strengthened by an intercalibration exercise carried out with IAEA-435 (tuna fish) from International Atomic Energy Agency, since

it has produced satisfactory results as well. The recovery of all compounds used in this paper ranged from 60% to 140% in both methodological tests. The analyzed organochlorines were: *o,p*'-DDT, *p,p*'-DDT, *p,p*'-DDD, *o,p*'-DDE, and *p,p*'-DDE, and 18 PCB isomers and congeners (08, 28, 44, 49, 52, 60, 66, 70, 87, 101, 105, 118, 128, 138, 156, 169, 170, 180 [11]).

Results and Discussion

Results are summarized in Table 1. ΣDDT concentrations were lower than ΣPCBs for all specimens analyzed. The ΣDDT/ΣPCB ratio was lower than 0.5. These results reflect the major influence of industrial activities and very high human aggregations in the drainage basins of Rio de Janeiro bays.

Table 1. Total length (cm), lipid content (%) and range/mean of organochlorine concentrations in blubber ($mg.kg^{-1}$ on a lipid basis) of males of marine tucuxi dolphins from Guanabara Bay and Sepetiba/Ilha Grande bays, Brazil.

Local	Total length (cm)	Lipid content (%)	ΣDDT $mg.kg^{-1}$ on a lipid basins	ΣPCB $mg.kg^{-1}$ on a lipid basins
Guanabara Bay	184-191	8.7-65.4	2.58 – 21.19 11.87	12.31 – 44,93 28.49
Sepetiba/Ilha Grande bays	150-195	10.1-68.0	1.11 – 10.27 4.86	2.17 – 26.69 14.75

Yogui *et al.* (2002) [2] reported a ΣDDT/ΣPCB ratio of 6.5 regarding marine tucuxi dolphin from Cananéia estuary, São Paulo Coast, Brazil. Those authors attributed the quoted ratio to agricultural characteristics of the Cananéia region, which was directly impacted by DDT in the past. Kajiwara *et al.* (2004) [3], analyzing males of marine tucuxi dolphin from Cananéia and Paraná, showed the same behavior described by Yogui *et al.* (2002) [2]. However, Kajiwara *et al.* (2004) [3] analyzed more PCB congeners than the reported by both, the present study and the investigation carried out by Yogui *et al.* (2002) [2]. Therefore, any comparison between our PCB results should be accomplished carefully. The ΣPCB concentrations verified in the present study, in general, were similar to those reported by Kajiwara *et al.* (2004) and higher than those showed by Yogui *et al.* (2002) [2]. The PCB with higher concentration in all samples was PCB-153. Regarding ΣDDT, our results show the lowest concentrations among the three investigations considered (Table 2). A *p,p'*-DDE/ ΣDDT ratio higher than 0.6 indicates a not recent usage of this pesticide in the region, as verified by Yogui *et al.* (2002) [2] to Cananéia estuary.

Table 2. Comparative PCB and DDT concentrations (mg/kg^{-1} on a lipid basins) of three different studies in male of marine tucuxi dolphin from Brazilian Coast.

Reference	Total length (cm)	Number of analyzed specimens	ΣDDT $mg.kg^{-1}$ on a lipid basins	ΣPCB $mg.kg^{-1}$ on a lipid basins
Yogui *et al.* (2002) [2]	184-191	4	7.24 – 125,0 72.3	1.61- 7.6 5.7
Kajiwara *et al.* (2004) [3]	150-195	8*	12,0 – 150,0 52,0	10.0 -79.0 34.0
Present study	150-195	8	1.11 – 21.19 8.37	2.17 – 44.93 21.62

* Only mature males

Studies have been showed that *Sotalia* presents a high residence pattern in these bays, especially in Guanabara bay[7]. Thus, the concentrations verified in its tissues reflect the flow of organochlorines through local food chains. Therefore, the coastal bays considered here may be regarded as hot-spots for organochlorine

contamination. In addition, since organisms constitute an important via of pollutant transport between ecosystems[12], there is also the possibility that these bodies of water work as exporting environments, sending persistent organic pollutants to continental shelf and adjacent oceanic region.

The organochlorine concentrations presented in this study are comparable to those observed in highly industrialized regions of Northern Hemisphere. Studies focusing on the role of coastal bays as pollutant exporting systems as well as investigations addressing the flow of organochlorine throughout the food chains in which *Sotalia* takes part in are essential.

Acknowledgements
The authors give thanks to Prof. Dr. Jean R. D. Guimarães for lending part of the equipment used in this study and to The Rio de Janeiro Fire Department (CBERJ) and The Cleaning Company of Rio de Janeiro City (COMLURB) for helping with the recovery of the dolphin carcasses. Being a team work, the interns of the Aquatic Mammals Laboratory (UERJ) are also acknowledged. This work was supported by the Ministry of Education of Brazil – CAPES and by the Brazilian Research Council – CNPq. Naomi Rose from the Humane Society is also acknowledged for financial help. Since Dr. Torres is partially funded by Grant 1D43TW00640 from the Fogarty International Center of the National Institute of Health, this institution is also acknowledged.

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