

POPS IN PONTOPORIA BLAINVILLE (FRANCISCANA DOLPHIN) FROM BRAZILIAN COAST: PAST, PRESENT AND FUTURE TRENDS

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Introduction

Every year a large amount of new man-made compounds are produced to meet the increasing demand for many new materials in modern life. Unfortunately, several of these compounds have undesirable effects to both humans and wildlife, such as immunologic, reproductive, and teratogenic dysfunctions (Tanabe et al. 2004). Among several concern compounds, PCBs, chlorinated pesticides, PBDEs, PFOS, and PFOSA have been receiving special attention over the last decades due to their characteristics of persistence, bioaccumulation and toxic effects and are classified as Persistent Organic Pollutants by the Stockholm Convention (PNUMA 2002).

Widespread of these contaminants and their toxic impacts have been the subject of several studies over the past decades, particularly in the marine mammals, because they are long-lived, they are at the top of the aquatic food chain (Reijnders, 1986), they can transfer PCBs and chlorinated pesticides through lactation over generations and most have low capacity for xenobiotic degradation (Tanabe et al., 1988). Marine mammals may also be used to assess the bioavailability and bioaccumulation of selected POPs in the marine environment worldwide and over long time spans, and may provide a model for human exposure to organochlorines from seafood consumption (Aguilar, 1987).

A large number of studies have reported high concentrations of POPs in marine mammals. However, most of these studies have been done in developed nations, especially from Northern Hemisphere. While it is possible to find hundreds of studies relating the occurrence of PCBs, PBDEs and PFCs in marine mammals in the USA, so far less than 20 were found within this subject in Brazil, and it includes no published work, and all of them are from Southern and Southeastern Brazilian coasts. One of the most studied species in Brazil is the franciscana dolphin, *Pontoporia blainvillei*, a small cetacean with a distribution restricted to the southwest Atlantic Ocean (Bastida et al., 2007).

Because franciscana is a coastal/estuarine dolphin, this specie is particularly vulnerable to the activities of humans due to their confined habitat, which is in close proximity to point sources of pollution. The existence of two populations of franciscana dolphin is strongly supported by morphological and molecular data (Secchi et al. 1998, Pinedo 1991). The northern population occurs to the North of Santa Catarina State in Brazil and the southern population occurs to the South of Santa Catarina State. The southern population is listed as "vulnerable specie" in the International Union for Conservation of Nature and Natural Resources (Secchi & Wang 2003).

The present study is aimed to understand the POPs contamination in franciscana dolphins incidentally caught along Brazilian coast, including temporal and spacial variations.

Materials and Methods

Studies that have been done with franciscana included analyzes of pesticides chlorinates (OCPs), PCBs, PBDEs and PFCs in samples from Southern and Southeastern Brazilian waters (Borrelet al., 1995; Kajiwara et al., 2004; O'Shea et al., 1981, Leonel et al 2010, Leonel et al. 2008) and comprehend spatial and temporal studies.

Results and Discussion

POPs concentrations detected in franciscana dolphins from Southern and Southeastern Brazil are presented in Table 1. PCBs levels are similar em both populations ($\sim 5000 \text{ ng g}^{-1}$) whereas DDTs levels in Northern population are higher (9900 ng g^{-1}) than those detected in franciscana from the Southern (5300 ng g^{-1}). Therefore, PCBs/DDTs ratio

in sample from Southern population was approximately 4.9 and for Northern population was about 0.5. Samples from Northern population are collected in the Cananéia-Paranaguá area which was impacted by DDTs in the past (1970s-1980s). However, the predominance of p,p'-DDT, the most persistent DDT metabolite, in all samples imply in no recent input of DDT in both region probably as a result of the legal restrictions on production and use of almost all chlorinated pesticides in the 1980s–1990s (PNUMA, 2002).

PBDEs levels in Franciscana from southern population (13.38 to 65.02 ng g⁻¹ lw) were one order of magnitude lower than PBDEs levels found in Franciscana from northern population (93.62 to 655.86 ng g⁻¹ lw). The larger values in samples from northern population confirms that PBDEs, as most other POPs, are found at higher concentrations in environmental matrices collected near industrial or human populations centers. Franciscanas samples from northern population were collected from São Paulo coast, the economic center of Brazil. In this area is localized the Santos and São Vicente Estuary System. Besides tourism, the region has one of the most important petrochemical, chemical and metallurgical industrial center in Brazil, the Cubatão industrial complex. In addition, the largest commercial harbor of South America, the Port of Santos, is located in the same area e represents another potential contamination source.

PFCs were only analyzed in samples from Southern population and their levels are relatively low. PFOS was the predominant compound with concentration range from 3.6 to 42 ng g⁻¹ wet weight (mean: 24 ng g⁻¹) (Leonel et al. 2008).

OCPs, PCBs and PBDES were analyzed in samples collected from 1994 to 2004 in the Southern population. PCBs and Mirex levels did no change during the period of study, while DDTs, Dieldrin, HCB and CHLs concentrations decreased. On the other hand PBDEs showed a exponential increase in the same period. The lack of changes in PCBs levels are probably related to inputs originated from remaining stocks of PCBs-containing equipments and environmental recycling and imply that PCBs levels will be a threat for the next years. The increased in PBDEs concentration are probably related to economic development, coupled with agricultural and industrial activities that results in increased production and usage of these chemicals.

Overall levels of POPs in franciscana dolphins are lower, particularly when compared with those reported in marine mammals from the Northern Hemisphere. However, the presence of emergent contaminants (such as PBDEs and PFCs) and the increase concentrations of some of them (PBDEs) over the last decade imply that they can represent a significant threat for the next generations. Therefore, continuing investigations should be conducted in order to follow the future trends of POPs in these Brazilians regions.

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Table 1: levels of DDTs, PCBs, PBDEs and PFCs in *Pontoporia blainvillei* from Brazilian waters.

Region	Year	Sex	PCBs	DDTs	PBDEs	PFCs	Reference
Southern population	1994-2004	males	5129	1037			Leonel et al. 2010
					13-65		Leonel 2007
						3.6-42	Leonel et al. 2008
Northern population							
	1997-1998	males	5300	9900			Kajiwara et al. 2004
					93-655		Leonel 2007