

# Learn from contaminants in the short-finned pilot whale stranded on the coast of Indonesia: How healthy its sea ecosystem?

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## Introduction

- ⇒ **Short-finned pilot whales (SFPW)** are a group of cetaceans found in tropical and temperate seas and commonly stranded in the group.
- ⇒ **Exposure to toxic, persistent, bio-accumulative and endocrine disruptor chemicals such as polychlorinated biphenyls (PCBs)** might be as one of factors for survival of the cetaceans.
- ⇒ Due to their lipophilic nature, **PCBs** can accumulate in lipid-rich blubber and might be implicated in adverse effects on their immune and endocrine systems.<sup>1</sup>
- ⇒ To our knowledge, no detail information on the **contamination status** and **bioaccumulation** of halogenated organic compounds, including PCBs in the SFPW from Indonesian waters.

## Objective

To investigate the concentrations, accumulation profile, potential sources,

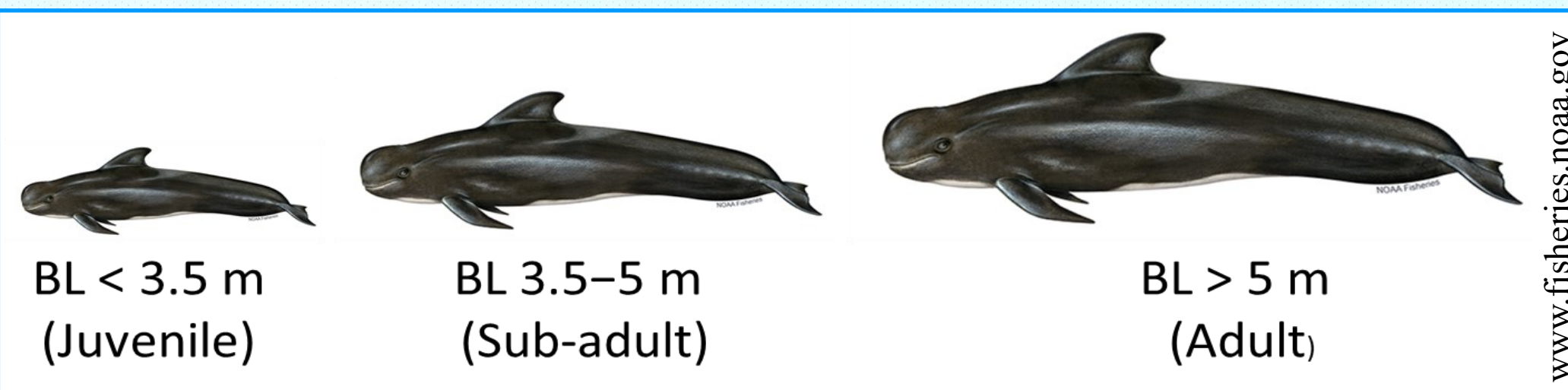
## Materials and Methods

### Stranded location and blubber sampling



Stranding location and date:  
Haingahu beach-Savu Island, Indonesia  
October 1, 2012

20 blubber tissues sample : gender (5 female, 2 male, 13 underdetermined gender) and estimated age (6 Juvenile, 10 sub-adult, 2 adult, 2 undetermined age)



### Sample analysis

Blubber sample (2 g)  
Cut into small pieces and placed in 50-mL glass tube

Sequential extraction with Ultra-Turrax T 25 homogenizer  
Acetone 20 mL    Hexane:Acetone (1:1 v/v) 20 mL    Hexane 20 mL

5 mL extract + 100 µL <sup>13</sup>C<sub>12</sub>-PCB surrogate standard 10 ng/mL

1 mL extract for lipid determination with gravimetry method

Clean-up with multilayer silica gel column (44% H<sub>2</sub>SO<sub>4</sub>-silica, 22% H<sub>2</sub>SO<sub>4</sub>-silica, Na<sub>2</sub>SO<sub>4</sub>)

GC-HRMS (Agilent GC 6890N-JMS-800D)

100 µL <sup>13</sup>C<sub>12</sub>-PCB internal standard

- ◆ Recoveries of surrogate standard : 80-100%
- ◆ RSDs of replicate samples : <15%
- ◆ Methods detection limit (MDLs) : 10-50 pg/g wet weight
- ◆ Recoveries of SRM 2972a (55-98%) dan NMIJ CRM 7404-a (71-95%)

### Acknowledgement

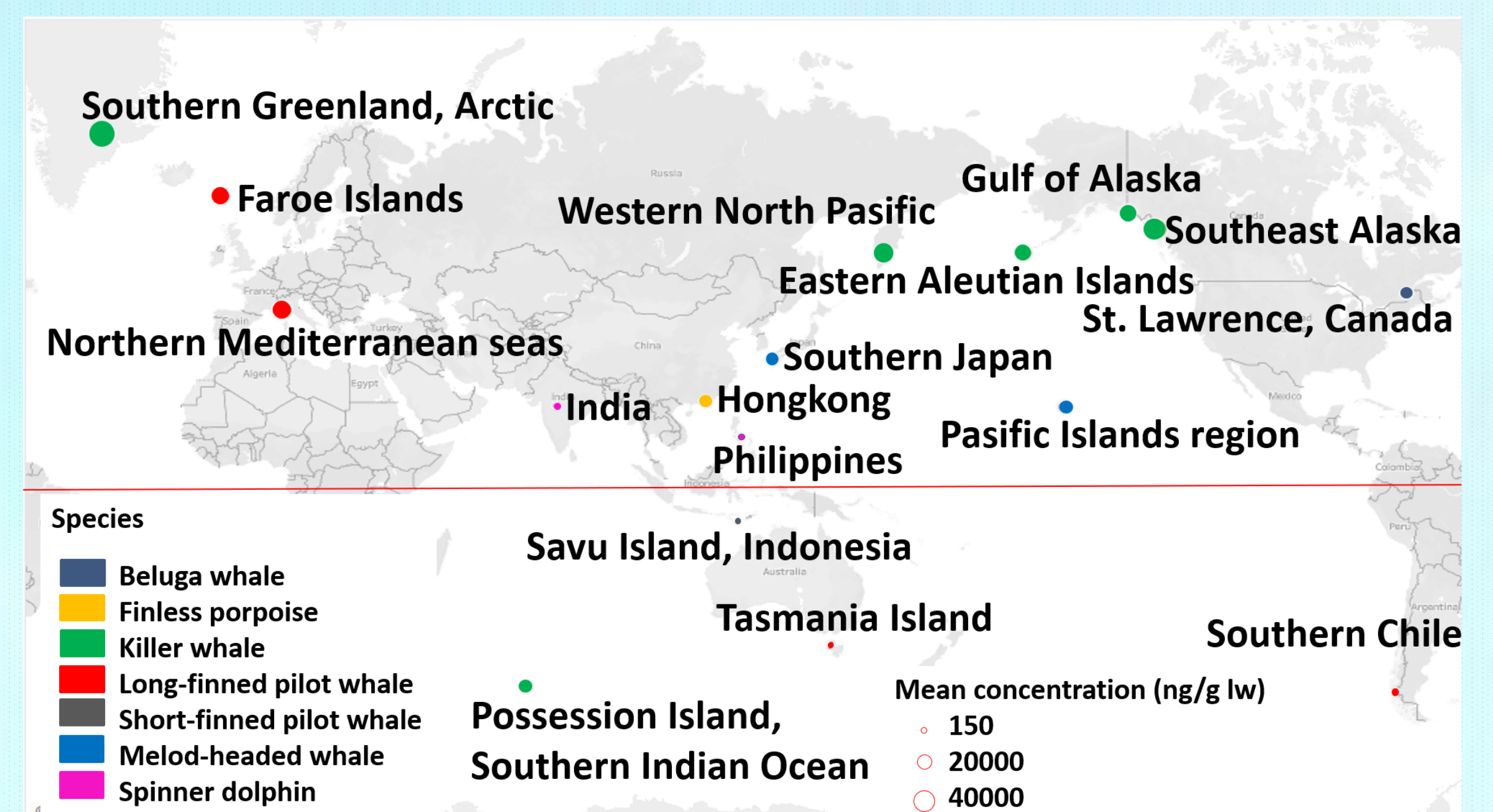
⇒ This study was partially supported by funding of LIPI's Priority Research via Coral Reef Management and Rehabilitation Program-Coral Triangle Initiative (COREMAP-CTI) fiscal year 2018 (Grant No. B-2485/IPK/HK.01.03/2020) and Lamer Grant Program fiscal year 2018 (Project No.: 30-28).

### Reference

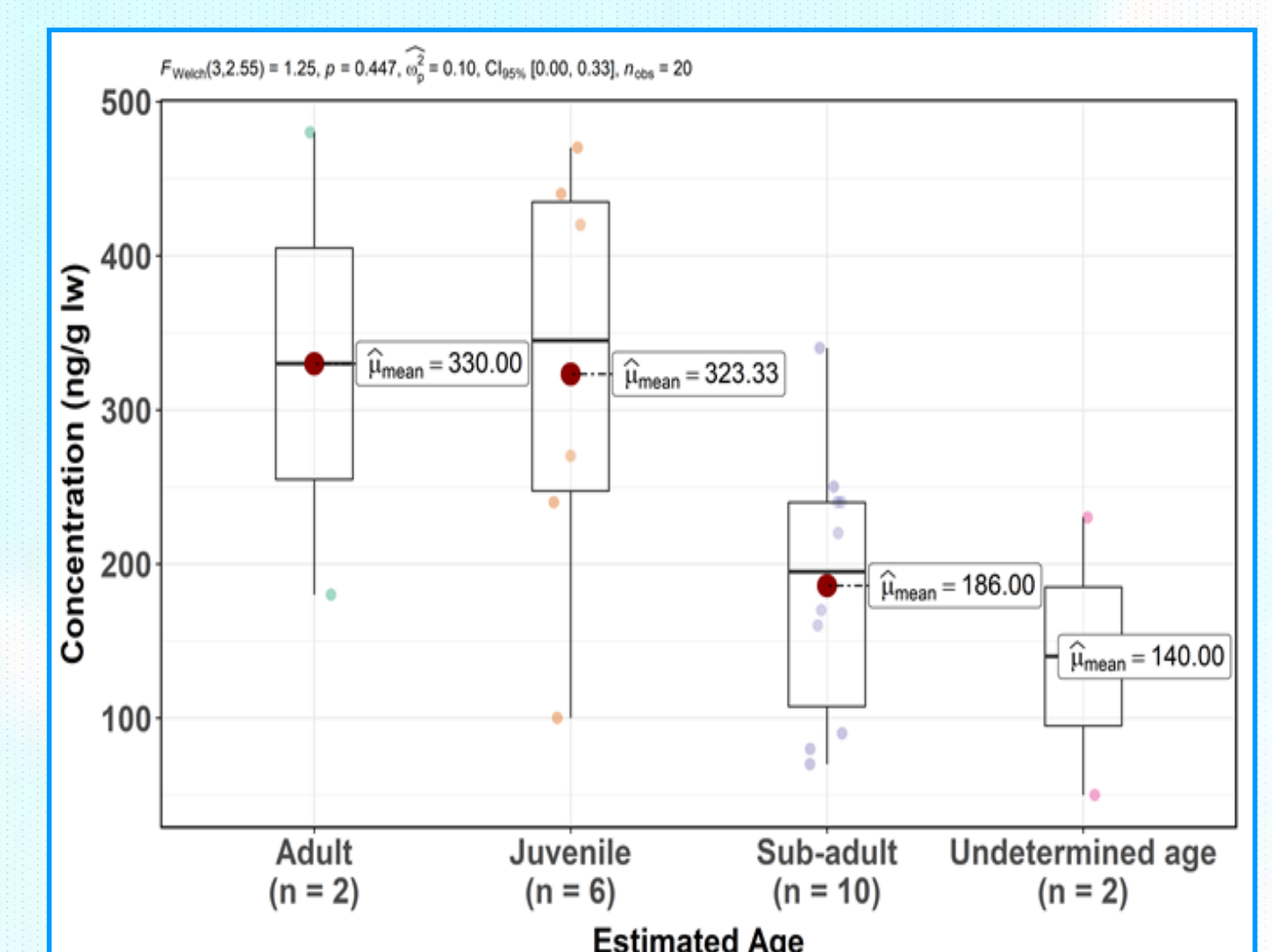
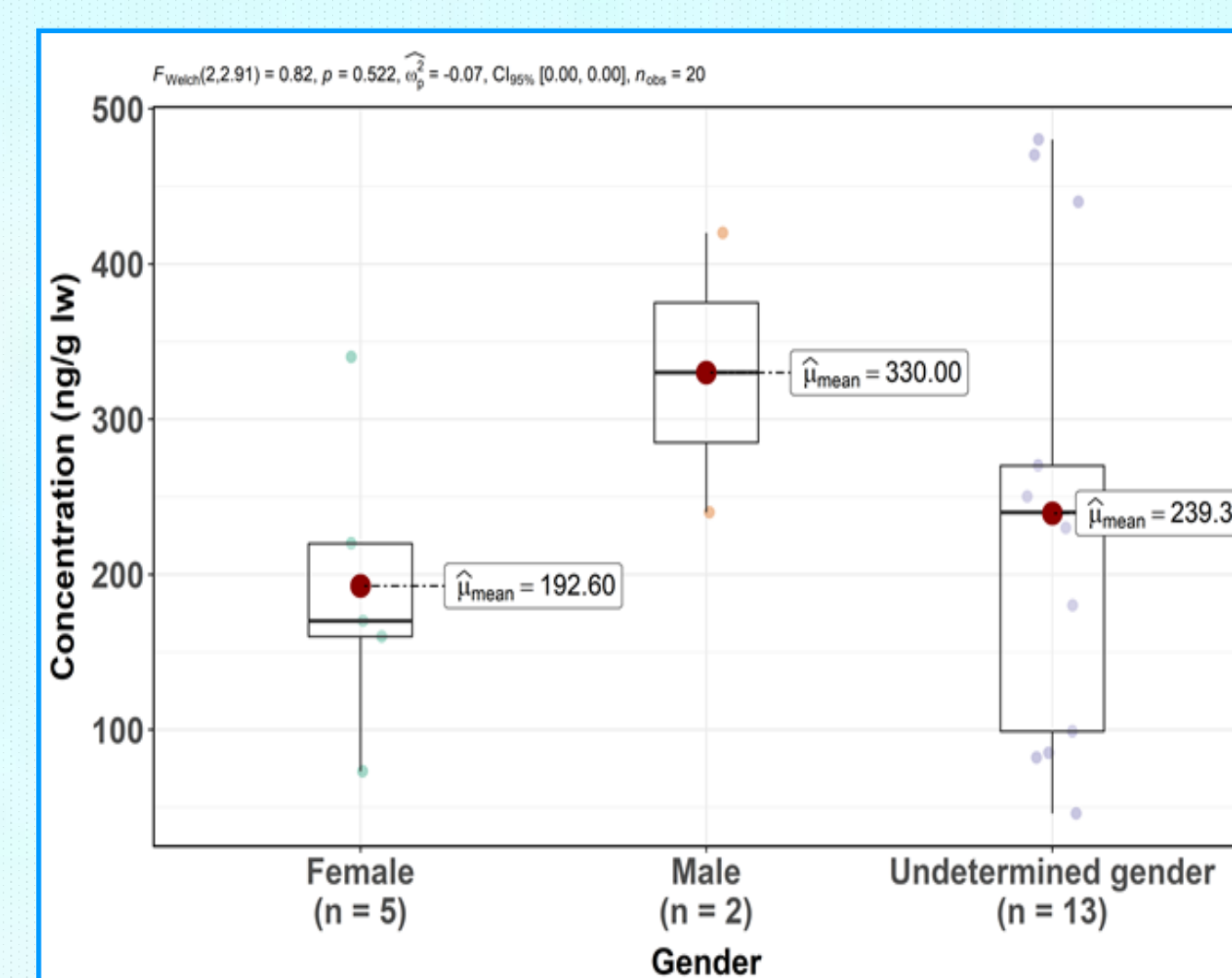
<sup>1</sup>Troisi, G.M., et al. 2020. Arch. Environ. Contam. Toxicol. 78, 513-524; <sup>2</sup>Garcia-Cegarra, et al. 2021. Sci. Total Environ. 770, 145259; <sup>3</sup>Weijjs, L., et al. 2013. Sci. Total Environ. 461-462, 117-125; <sup>4</sup>Pedro, S., et al., 2017. Sci. Total Environ. 601-602, 237-246.

## Results and Discussion

- ⇒ Concentrations of  $\Sigma_{209}$ PCBs,  $\Sigma_7$ indicator-PCBs,  $\Sigma_{12}$ dioxin-like PCBs, and unintentional PCB were between **50-480 (mean: 240±130)**, **22-230 (110±60)**, **2.5-38 (17±10)**, and **31-300 (150±86)**, ng g<sup>-1</sup> lw, respectively.
- ⇒ The average concentration of  $\Sigma_{209}$ PCBs were comparable to reported studies in the southern hemisphere (**Tasmania Island and Chilean Patagonian**) but much lower compared to studies from northern hemisphere (**Mediterranean Seas and Faroe Island-North Atlantic**).<sup>2,3,4</sup>



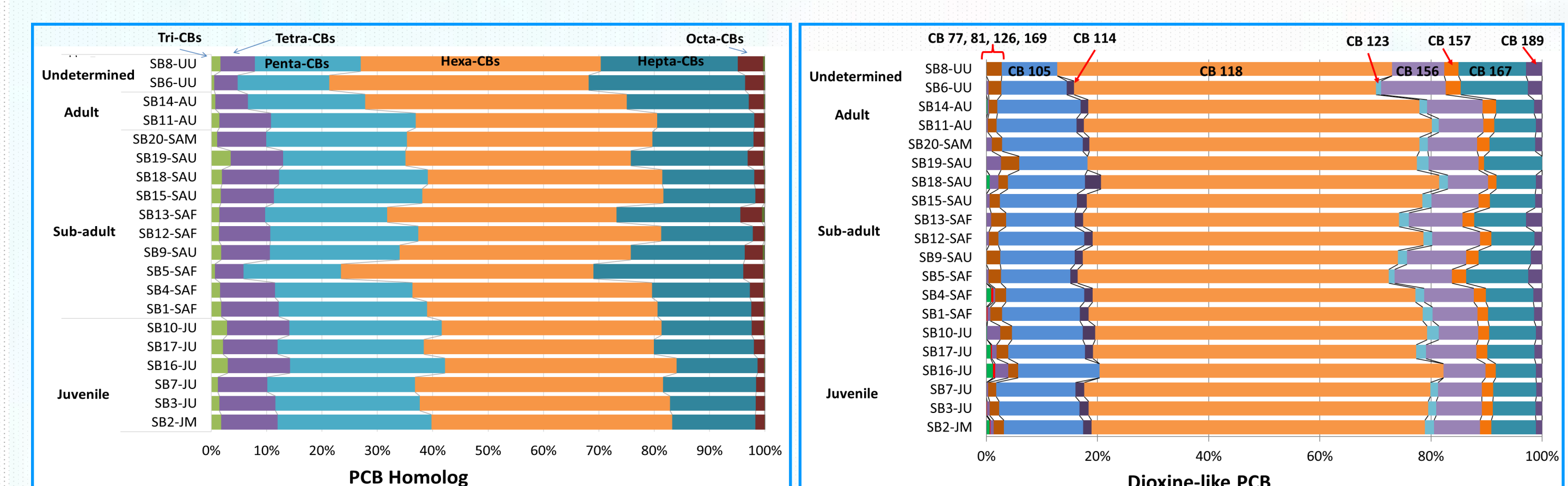
- ⇒ **Relative high concentration of PCBs** in the male than female group and juvenile than sub-adult group are further consideration, even though not statistically significant because of the limited number of samples



- ⇒ Relative proportion to total PCB, **no PCB congener pattern differences** found among PCB homolog, dioxine-like PCB, SAG, and indicator PCBs.

- ⇒ PCB pattern have similarity with commercial formulations such as Ar1254, Ar1260 (Arochlor), KC500 and KC600 (Kanechlor).

- ⇒ **TEQs value of dioxin-like PCB** in the blubber tissues were between **2.1-60 pg TEQ/g lw**.



## Conclusion and Outlook

- ◆ **Concentration of PCBs and TEQ value of dioxin-like PCBs** were below the threshold values for adverse health effect for marine mammals and revealed that their habitat is in good and health condition.
- ◆ **High concentration of PCBs and TEQ dl-PCBs** in the juvenile of SFPW showed transferring of PCBs from mother to the off-spring and informed a serious conservation concern for the early stage of short-finned pilot whales in Indonesia.
- ◆ **Further collaboration to investigate and study on cetaceans** in Indonesia from all aspects, not only biological aspects but also chemical aspects which related to their health is needed.