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Cover: Common Silverline *Spindasis vulcanus vulcanus* in poster colours adapted from photograph by Kalpesh Tayade. © Pooja R. Patil.

Table 1. Sample size, fork length, weight and Hg concentration (wet and dry basis) in the muscle of *Thunnus albacares* and *Thunnus obesus* from the western equatorial Atlantic Ocean. The values are shown as the median $\pm$ interquartile range (minimum and maximum). Lowercase letters compare the variables between sampling years for the same species. Uppercase letters compare the variables between species and consider the data from both samplings.

Species	<i>T. albacares</i>		<i>T. obesus</i>	
Year	2019 (n = 32)	2020 (n = 18)	2019 (n = 26)	2020 (n = 6)
Fork length (cm)	123.5 $\pm$ 22.3 ^a (97–167)	139.5 $\pm$ 9.3 ^b (129–176)	104 $\pm$ 38 ^a (91–181)	104.5 $\pm$ 5.3 ^a (101–111)
Weight (kg)	25.5 $\pm$ 19.6 ^a (12.6–65.2)	39.5 $\pm$ 9.5 ^b (29.3–76.1)	18.2 $\pm$ 20.7 ^a (11.9–72.3)	18.5 $\pm$ 1.5 ^a (16.9–20.4)
Hg (ng·g ⁻¹ wet weight)	168.3 $\pm$ 80.2 ^a (82.1–455.1)	309.5 $\pm$ 98.8 ^b (103.2–570.3)	499 $\pm$ 195.9 ^a (204.1–1347.5)	457.7 $\pm$ 51.9 ^a (387.7–475.1)
Hg (ng·g ⁻¹ dry weight)	636.6 $\pm$ 303.4 ^a (310.6–1722)	1170.9 $\pm$ 373.9 ^b (390.5–2157.6)	1840.5 $\pm$ 722.5 ^a (752.8–4970.4)	1688.5 $\pm$ 191.4 ^a (1430–1752.5)
Log [Hg (ng·g ⁻¹ wet weight)]·kg ⁻¹	6.7 $\pm$ 2.5 ^a (3.4–11.9)	7.2 $\pm$ 2.7 ^b (3.5–19.1)	26.7 $\pm$ 8.4 ^a (4.9–49.7)	23.4 $\pm$ 2.8 ^a (20.2–28.1)
All samples	<i>T. albacares</i>		<i>T. obesus</i>	
Fork length (cm)	132.5 $\pm$ 23.5 ^A		104 $\pm$ 20 ^B	
Weight (kg)	32.4 $\pm$ 20 ^A		18.2 $\pm$ 9.1 ^B	
Hg (ng·g ⁻¹ wet weight)	212 $\pm$ 149.6 ^B		475.1 $\pm$ 107.8 ^A	
Hg (ng·g ⁻¹ dry weight)	802 $\pm$ 565.9 ^B		1752.5 $\pm$ 397.7 ^A	

sampled at the market were caught from commercial fishery done by the fishing fleet of *Areia Branca* Harbor. This fishing fleet operates in the western equatorial Atlantic Ocean (off northern Brazil), in the vicinity of one of the oceanic buoys of PIRATA Program (“Pilot Moored Array in the Tropical Atlantic”). The fishing area is located in waters that are 4,000 m deep, at 0°, 35 °W, and 600 km offshore (international waters). The sample size for *T. albacares* was 32 individuals in 2019, and 18 individuals in 2020; and for *T. obesus* it was 26 and six individuals in 2019 and 2020, respectively. Sample of meat from the fish belly (5 g of wet weight) was removed from each individual at the fish market. The samples were brought to the laboratory and kept frozen (-20 °C) in dry sterile vials, freeze-dried and homogenized with a mortar and pestle (Table 1). Mercury determinations followed Bastos et al. (1998) and were conducted with an ICP-OES (Varian, Liberty II Model 720 ES, Australia) with a cold vapor accessory (VGA-77). The recovery values for the certified reference material (DORM-4) ranged 85–95 %. The coefficients of variation of the triplicate analyses were <10%. The results were calculated as ng·g⁻¹ dry weight and converted to a wet weight basis. For *T. albacares*, the water loss after freeze-drying was 74 $\pm$ 1%, and for *T. obesus*, it was 73 $\pm$ 1%.

The maximum permissible limit for Hg in predatory fishes established by the World Health Organization—WHO (FAO/WHO 1991) and Brazilian Government (ANVISA 2021), is 1 mg·kg⁻¹ (or 1,000 ng·g⁻¹) wet weight. The estimated daily intake proposed in Caldas et al. (2016) was used for the intake analysis: EDI = C·IR/BW,

where EDI is the estimated dietary intake of Hg (μg·day⁻¹·kg⁻¹), C is the Hg concentration in the fish meat (μg·g⁻¹ wet weight), IR is the intake rate in Brazil (27 g·day⁻¹; Barone et al. 2017), and BW is the body weight (70 kg for a Brazilian adult). The provisional upper tolerable weekly intakes - PTWI limit for Hg is 1.6 μg·week⁻¹·kg⁻¹ or 0.57 μg·day⁻¹·kg⁻¹ (FAO/WHO 2003). We calculated the IR of tuna meat that would be necessary to reach the intake limit for Hg. We considered the median Hg concentration as a fixed variable and applied the EDI formula to estimate the IR needed to reach the intake limits established by the FAO/WHO (2003).

ANOVAs (aov function, base package; R Core Team 2022) were used to test the differences in Hg concentrations among the species and sampling years. Estimations of Hg intake due to tuna consumption by humans were conducted by Monte Carlo Method (Khitilishvili 2016) to incorporate the variability of each variable (Hg concentration in fish, human intake rate and body weight) in the final results.

Total Hg concentration varied between sampling years for *T. albacares*, and between the two tuna species (higher Hg concentrations in *T. obesus*) (Table 1). *T. albacares* sampled in 2020 was larger and heavier than in 2019, and the size difference was consistent with the Hg concentrations, reflecting Hg bioaccumulation during the fish growth (Lacerda et al. 2017). The enrichment of more bioavailable organic Hg complexes in deep waters, such as methylmercury, and the tuna foraging depths explain the interspecific differences in Hg concentrations (Choy et al. 2009; Ferriss & Essington

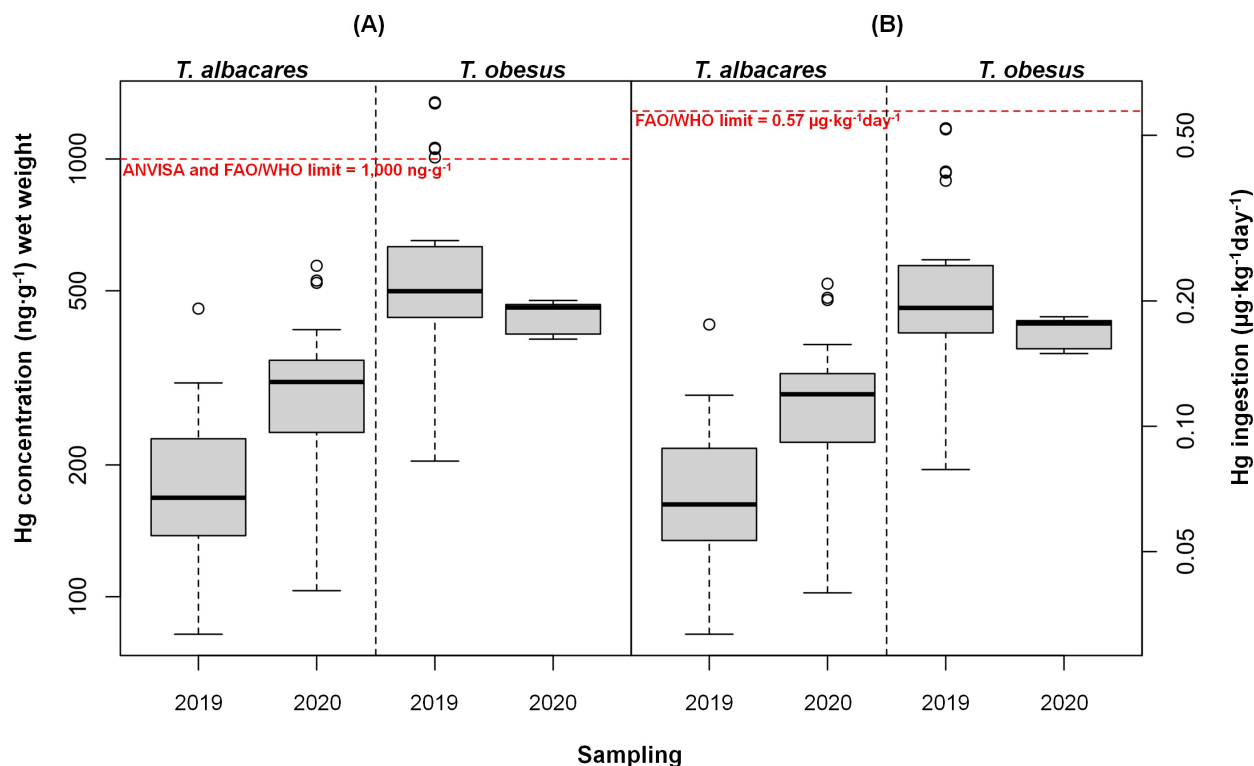


Figure 1. Medians, interquartile ranges, minimum and maximum values of Hg concentrations in *Thunnus albacares* and *Thunnus obesus* from the western equatorial Atlantic Ocean: A—Hg concentrations in muscle and the tolerable maximum limit established by ANVISA and FAO/WHO (dotted red line and value inside) | B—Hg intake estimates by adults and the tolerable intake limit (dotted red line and value inside). Open circles are outliers.

2011; Lacerda et al. 2017).

The Hg concentrations were below the maximum tolerable limits established by ANVISA (2021) and FAO/WHO (1991) for fishery products, except for five *T. obesus* whose concentrations were higher than the limit (1,000 ng g⁻¹) (Figure 1A). The estimates for Hg intake due to tuna consumption were below the tolerable intake limit established by the FAO/WHO (Figure 1B). This result was expected since the Brazilian *per capita* intake of fishery products is half of the world intake (9.75 kg·year⁻¹ x 20.5 kg·year⁻¹) (Barone et al. 2017; FAO 2020).

Currently, Brazil exports whole large tuna to Indonesia, Vietnam and the United States (<https://www.volza.com/exports-brazil/brazil-export-data-of-whole+tuna>). Considering that whole large tuna are exported to other countries, it is important to conduct case-by-case health risk assessments. In this sense, tuna consumption from the western equatorial Atlantic Ocean would pose a risk for human populations that ingest more than 80 g·day⁻¹ tuna meat (IR based on our most contaminated fish: *T. obesus* individuals caught in 2019). Both tuna species are safe for intake as seafood, at least in the present, but we recommend regular monitoring of both consumption rates and Hg levels,

since the encouragement of seafood consumption has increased worldwide, as well the anthropic pollution that reaches the ocean basins.

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