Complementary information on the Associative Behavior-Based abundance Index (ABBI) for western Indian Ocean skipjack tuna (*Katsuwonus pelamis*) obtained from echosounder buoys data

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ABSTRACT

This paper presents complementary information on the Associative Behavior-Based abundance Index (ABBI) for the western Indian Ocean skipjack tuna (*Katsuwonus pelamis*) presented in paper IOTC-2023-WPTT25(DP)-12. Using data from 2013-2022, we show that the ABBI is robust to the addition of new data to the time series. Estimates of the quarterly relative abundance per 10° × 10° strata and of the ratio between abundances of free-swimming and associated skipjack tuna are also provided, as requested during the WPTT25 Data Preparatory Meeting.

1. INTRODUCTION

This paper provides complementary information on the Associative Behavior-Based abundance Index (ABBI) presented in paper IOTC-2023-WPTT25(DP)-12. Following the requests of the 25th Working Party on Tropical Tuna Data Preparatory Meeting, we provide:

- The sensitivity of ABBI estimations to the addition of new data;
- The ratio between the estimated abundances of free-swimming skipjack tuna and associated skipjack tuna, obtained with ABBI;
- The quarterly estimates of the relative abundance of the skipjack population by 10° spatial strata.

2. MATERIAL AND METHODS

2.1. Sensitivity analysis

The *FOB-associated average tuna biomass* (*m*, see section 2.3.2. in IOTC-2023-WPTT25(DP)-12) appears as the primary variable likely to show a sensitivity to the addition to new data. This parameter was calculated for each stratum by multiplying the average catch-per-set of all FOBs by the average species composition (see section 2.3.2. in IOTC-2023-WPTT25(DP)-12 for details). When species composition values were missing in a given stratum (i.e., available sampled sets below the threshold of 20 sets), they were generated using their corresponding estimated marginal means (aka least-squares means, see section 2.3.2. in IOTC-2023-WPTT25(DP)-12 for details). A sensitivity analysis was run to

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evaluate if the values predicted by this model can vary when newer data is added. To this purpose, the regression model was built considering species composition data from 2013 to year Y_i, with Y_i in [2018 ; 2022]. ABBI values and the coefficient of variation of ABBI in the different strata were then calculated from the *m* values obtained with the different regression models, for different values of the ϕ parameter, following the methodology explained in IOTC-2023-WPTT25(DP)-12.

1. RESULTS

*3.1 Sensitivity of ABBI estimations to the addition of more recent data*ABBI estimates proved to be stable to the addition of new data to the time series, over the range of years that were tested (2018 to 2022), with coefficients of variation lower than 1% (Figure 1).

3.2 Ratio between the estimated abundances of free-swimming skipjack tuna and associated skipjack tuna

Figure 2 presents the ratio between the estimated abundances of free-swimming and FOB-associated skipjack tuna.

3.3 Quarterly estimates of the relative abundance of the skipjack population by 10° spatial strata

Figure 3 displays the quarterly estimates of the relative abundances of the skipjack tuna population by 10° × 10° spatial strata in the western Indian Ocean.

2. REFERENCES

Baidai, Y., Dupaix, A., Duparc, A., Dagorn, L., Deneubourg, J. L., & Capello, M. (2023). Associative Behavior-Based abundance Index (ABBI) for western Indian Ocean skipjack tuna (Katsuwonus pelamis) obtained from echosounder buoys data (IOTC Working Party on Tropical Tuna: Data Preparatory Meeting IOTC-2023-WPTT25(DP)-12). Indian Ocean Tuna Commission. https://iotc.org/documents/WPTT/2501/12

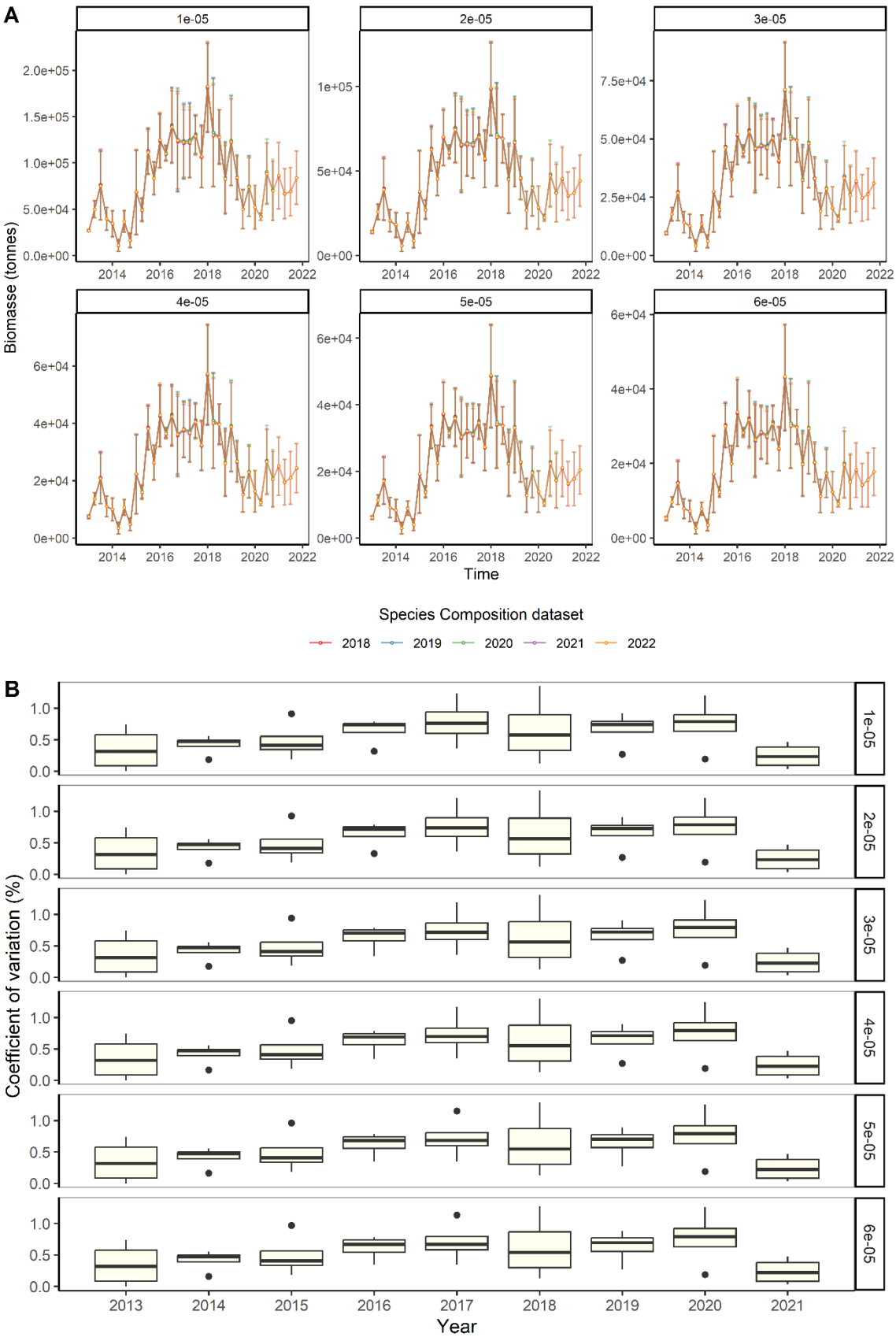

Figure 1: ABBI sensitivity to the addition of new data in the time series. (A) ABBI absolute abundance estimates. Each color corresponds to the last year of data included for the estimation of missing species

composition. (B) Box plots of the coefficient of variation estimated for the values of ABBI provided in Figure 1A, for different values of the ϕ parameter.

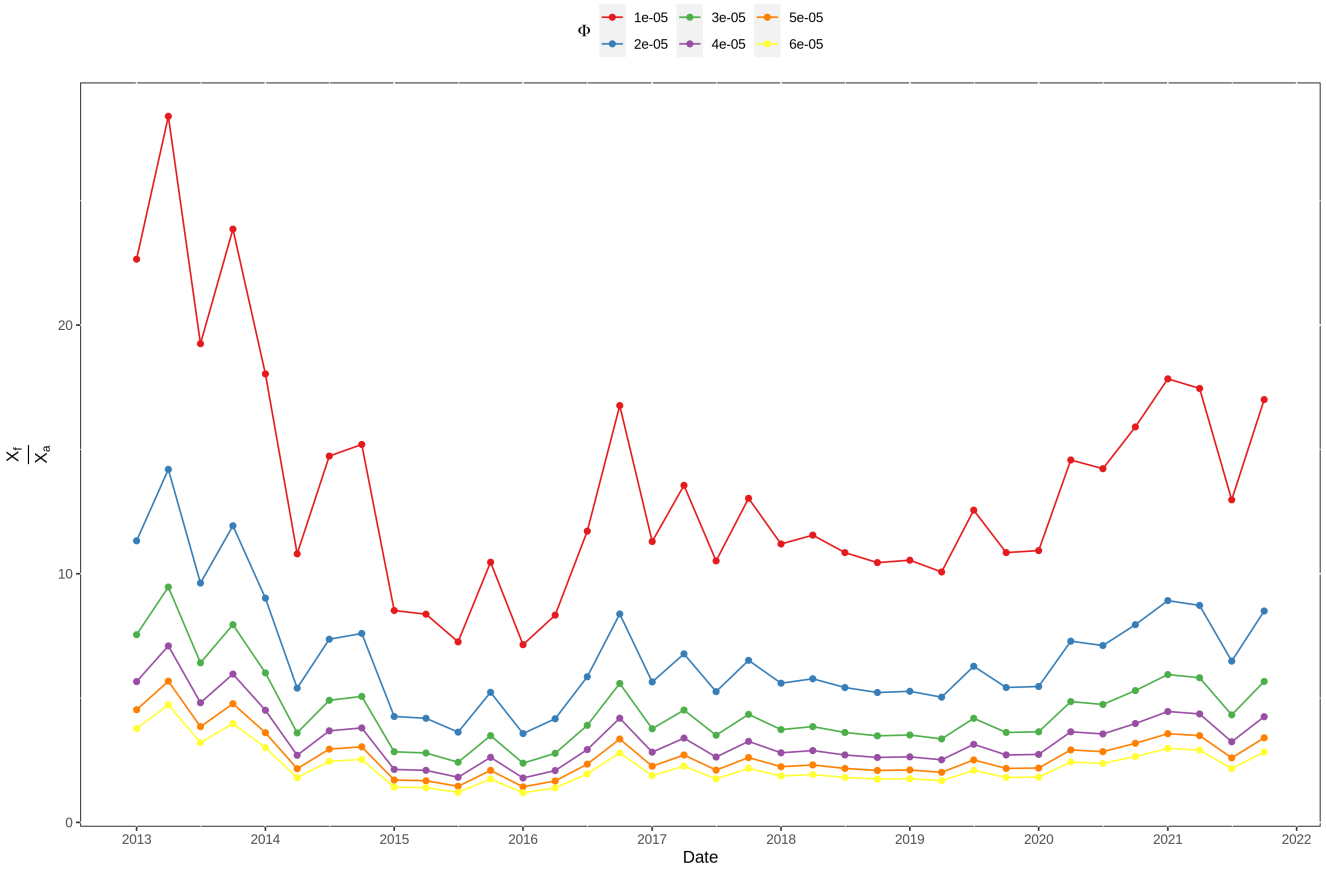

Figure 2: Ratio between the estimated free-swimming population and the FOB-associated population in the western Indian Ocean estimated using the ABBI approach for different values of the ϕ parameter.

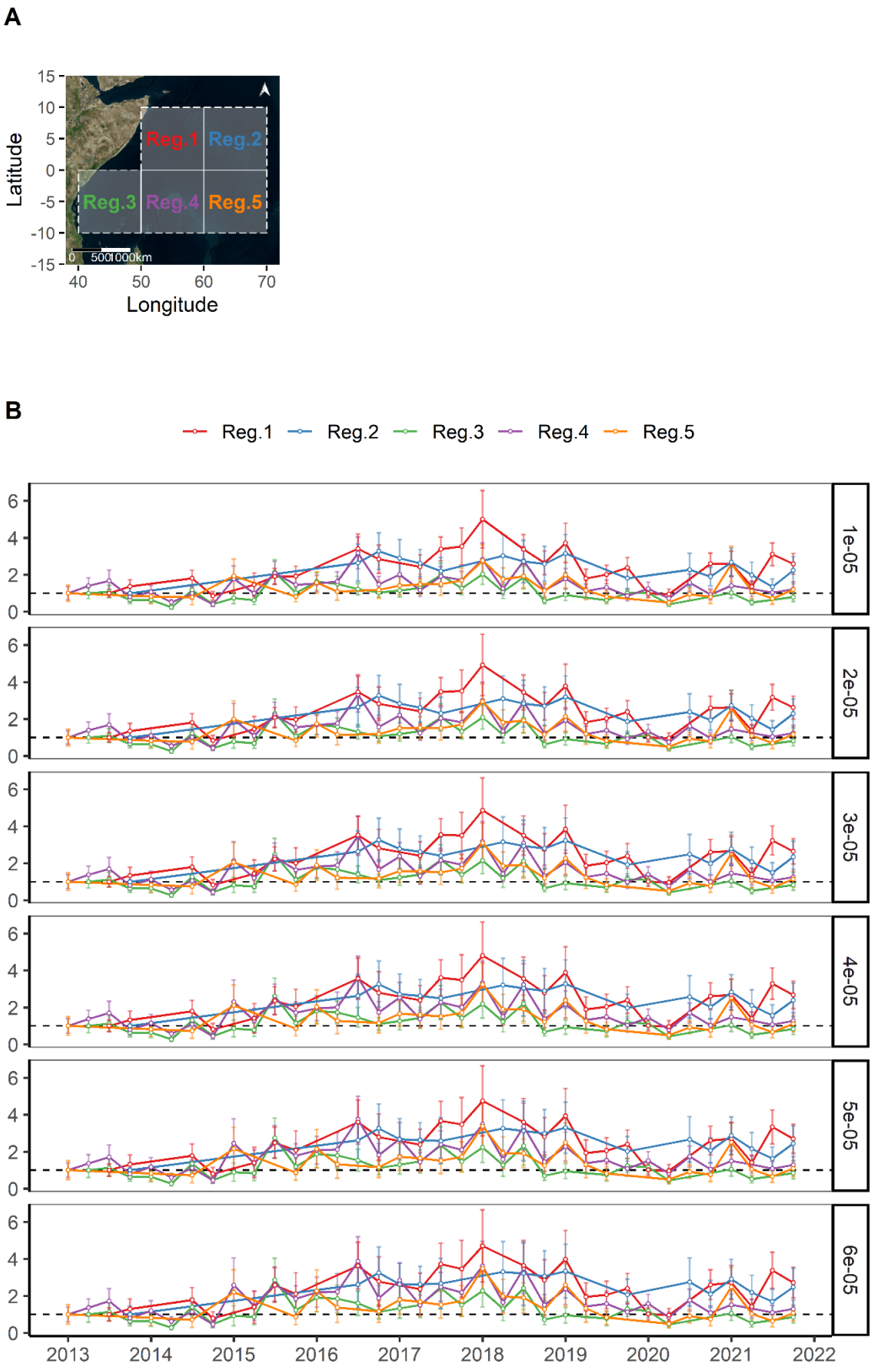

Figure 3: Quarterly estimates of the relative abundances of the skipjack tuna population by 10° × 10° spatial strata in the western Indian Ocean.