Estimation of tag-reporting rates for yellowfin, bigeye and skipjack tuna from tag-seeding experiments conducted during the AOTTP

Sosthène Akia, Amande Monin, Gaertner Daniel

12-14 JANUARY 2021, ICCAT / AOTTP SYMPOSIUM

Introduction

- Data collected during tuna tagging programmes are used to estimate biologicals parameters of tuna, such as growth rate, migration rate, exploitation rate, mortality rate(…), but they need to be standardized by correcting for potential biases

- One of the most important biases to consider is the proportion of reported tags among the actual recaptures tuna: the reporting rate

- Pollock et al. (2001, 2002, 2003) present three methods for estimating the reporting rate: use of planted tags on dead fish, knowing as tag seeding experiments use of high-reward tagging data and observers in multiple-component fisheries with 100% of reporting rate in one component.

- The tag seeding experiments method will be used to estimate the reporting rate for tropical tuna tagged during the AOTTP.

Data

- **924 tags seeded**

- **Year (temporal structure):** from 2017 to 2020
- **Gear type:** purse seiner and baitboat fleets.
- **Species :** YFT, SKJ, BET, UNK (unidentified species)
- **Landing location (spatial structure):** Côte d'Ivoire, Senegal, Brazil, South Africa and Ghana

Methods : Hampton (1997) + Hillary (2008)

- Step 1: analysis of factors affecting the reporting rate. Binomial GLM with selected factors

$y_i \sim Bernoulli(p_i)$, (tag return=1 and tag not return=0)

$$log\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 Species_i + \beta_3 Year_i + \beta_4 Landing\_loc_i + \beta_4 Gear_i$$

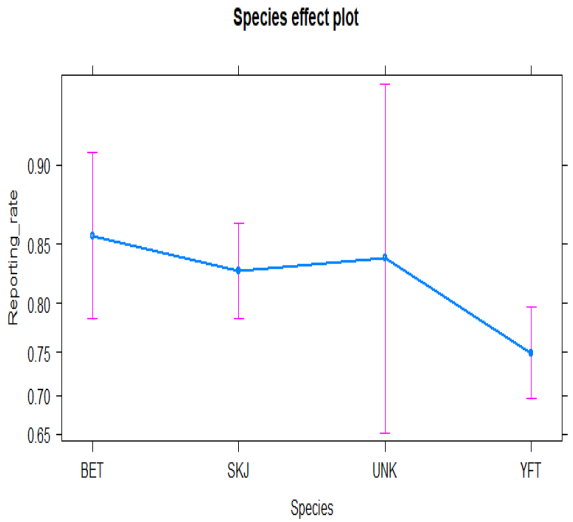
- Step 2: construction of strata with homogeneous reporting rate. Regression tree with significant factors

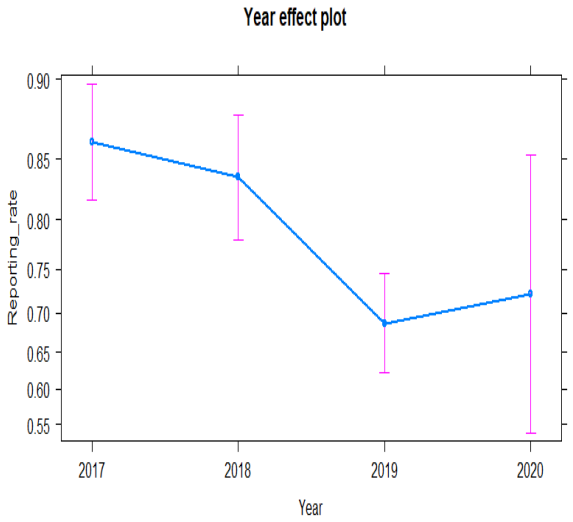
- Step 3: Bayesian approach (proportion) to estimate reporting rate by strata.

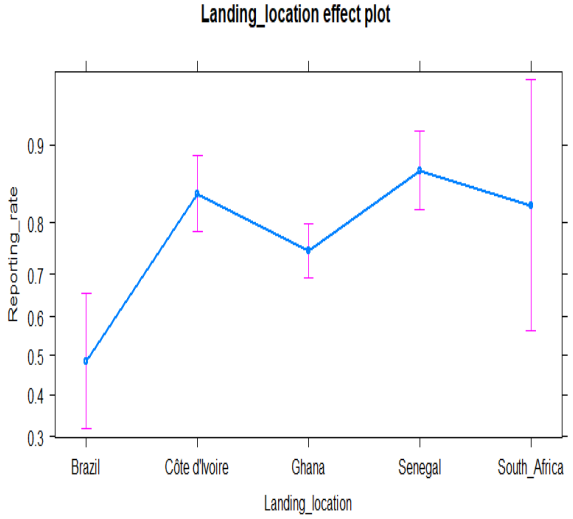
Results: binomial GLM (step 1)

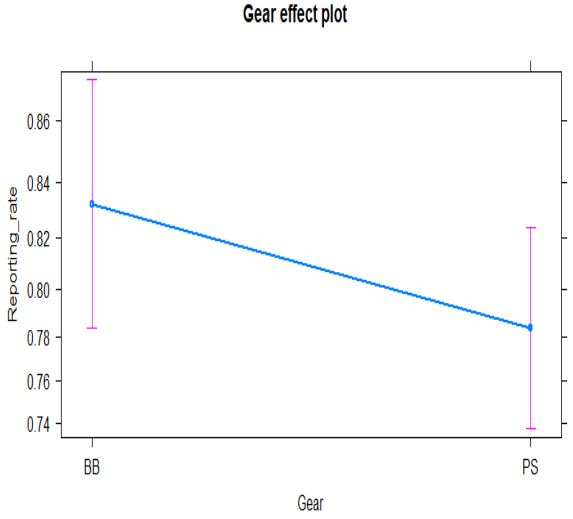
Anova results	Deviance explained	P-value
Species	8.94	0,0301*
Year	27.4	4.8e-06*
Landing location	34.2	6.7e-07*
Gear	1.911	0.1669

Parameter	Value
AIC	905.74
Residual deviance	881.74
Null deviance	973.02
Deviance explain	9.38%



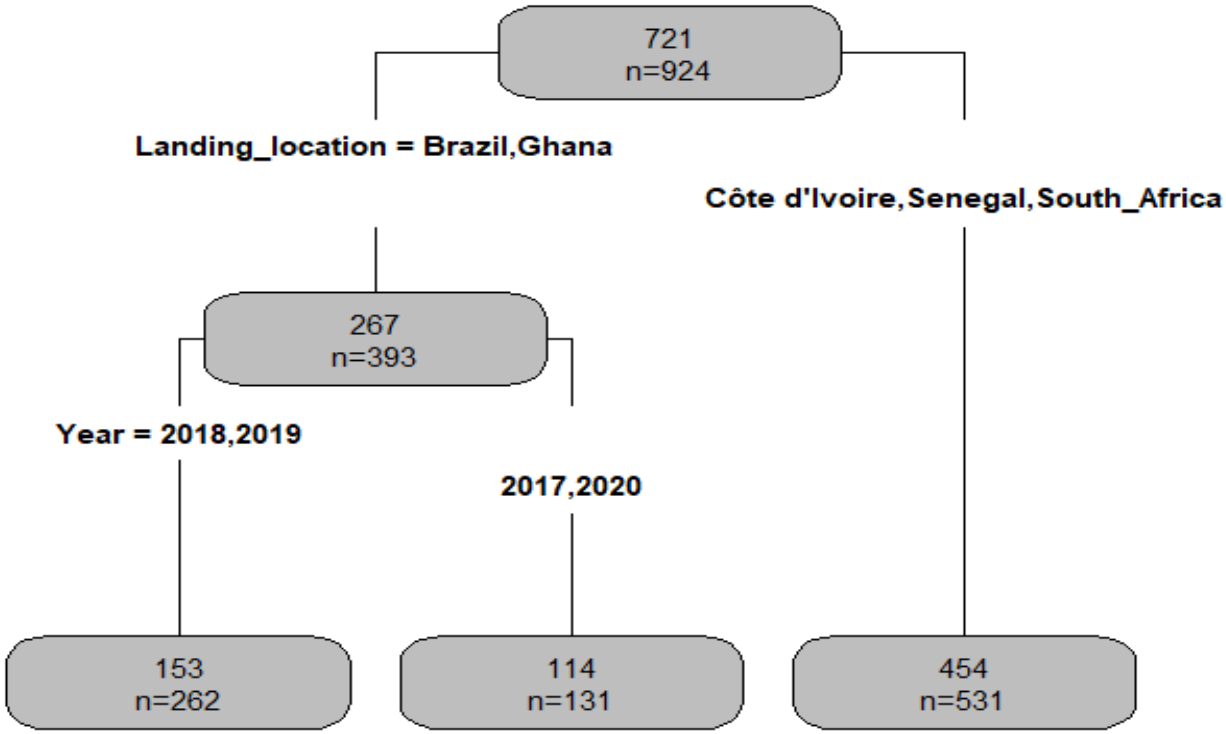




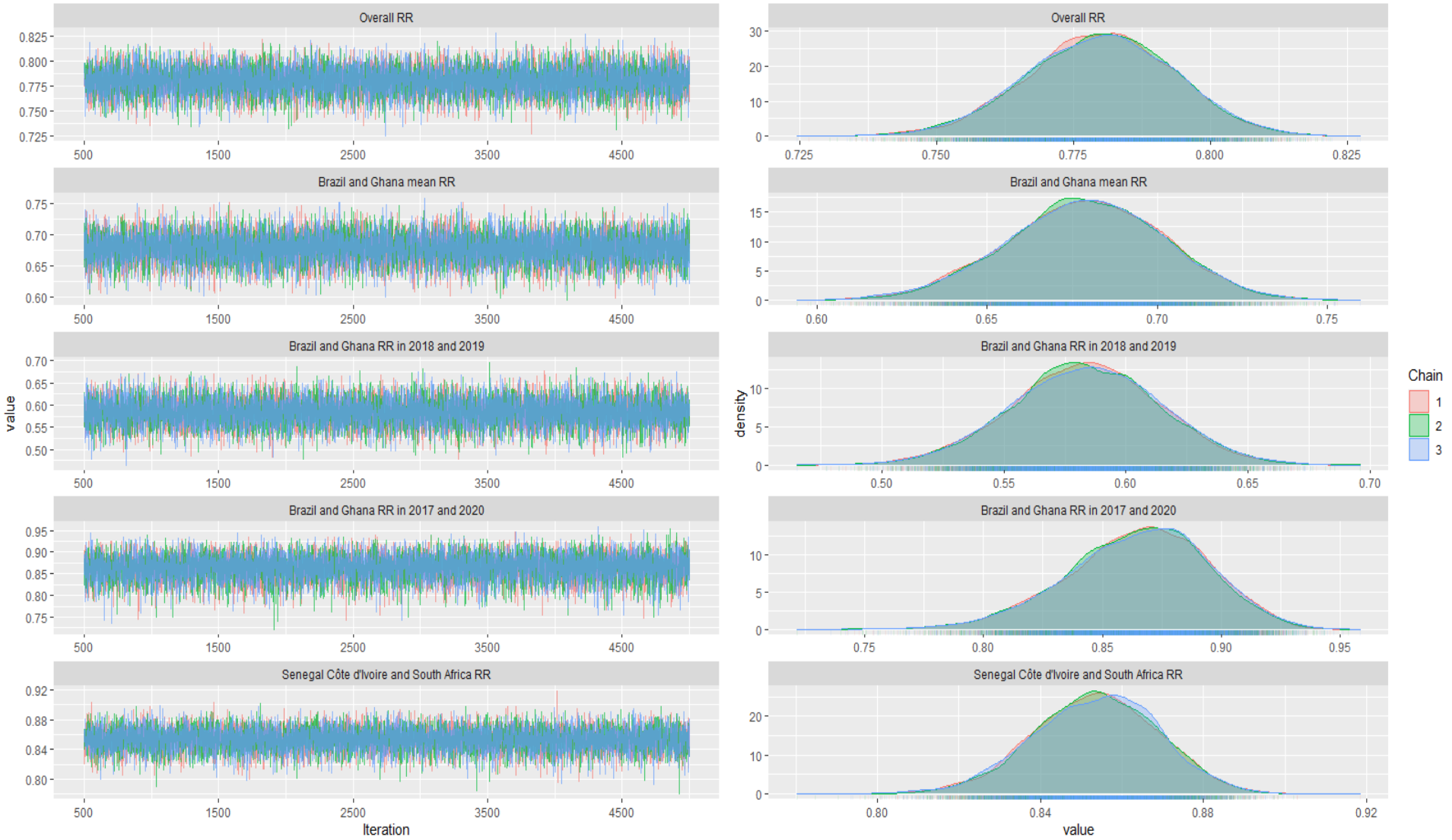


Results: regression tree (step 2)

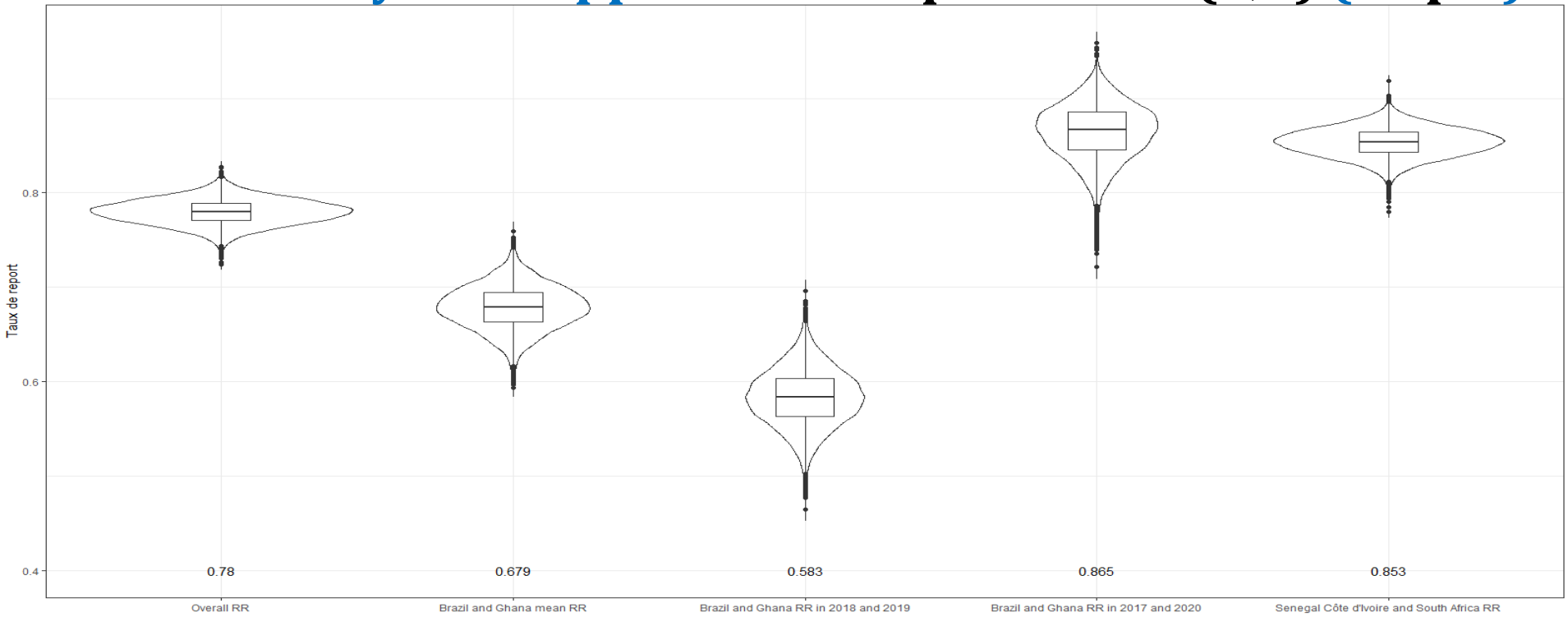
Strata	Tag seeded	Tag returned
Senegal, Côte d'Ivoire and South Africa	531	454
Brazil and Ghana (2018, 2019)	131	114
Brazil and Ghana (2017, 2020)	262	153
Brazil and Ghana (Mean)	393	267
Tag seeding experiments data	924	721



Results : Bayesian approach with prior~beta(1,1) (step 3)



Results : Bayesian approach with prior~beta(1,1) (step 3)



Strata	Mean	SD	q_2.5%	q_50%	q_97.5%
Senegal, Côte d'Ivoire and South Africa	0.85	0.015	0.82	0.85	0.88
Brazil and Ghana (2017, 2020)	0.86	0.029	0.80	0.86	0.91
Brazil and Ghana (2018, 2019)	0.58	0.030	0.52	0.58	0.64
Brazil and Ghana (Mean)	0.67	0.023	0.63	0.67	0.72
Overall reporting rate	0.78	0.013	0.75	0.78	0.80

Discussions

- Landing location, Year and Species

Hampton (1997) showed that there is evidence a spatio-temporal dependence of the estimate reported rate and that reporting rate between species was not significant. Ours findings reinforce these results.

- Gear

According to Carruthers (2015), the purse seiners reporting rate is the highest in the Indian Ocean. In the case of this study, no significant difference was found between the reporting rate of purse seiners and baitboats.

- Others factors

Others factors, such as the size of tuna, the quarter, the vessel flag, were analyzed in the literature but the availability and quality of the data did not allow us to further disaggregate the data and screen these aspects.

Acknowledgements

- ICCAT and AOTTP funders
- AOTTP cordinating team
- Consortium CISEF (Cap Vert, Cote d'Ivoire, Sénégal, Espagne, France)
- All AOTTP team : tag release and recovery teams, scientists…

Thank You

ANY QUESTION???

Result: Bayesian approach