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Comparisons of four splendid alfonsino growth equations in the SIOFA CA

Relates to agenda item 3

Info paper

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Abstract

There are four studies on splendid alfonsino growth equations in the SIOFA CA. All are based on ages estimated by otolith collected from the SIOFA CA. These equations are compared to evaluate.

Comparisons of four splendid alfonsino growth equations in the SIOFA CA

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1. Introduction

There are four studies on splendid alfonsino growth equations in the SIOFA CA. All are based on ages estimated by otolith collected from the SIOFA CA. These equations are compared to evaluate.

2. Comparisons

Table 1 is the summary of comparisons of these four equations with relevant information and Fig. 1 shows four growth equations. Map 1 shows locations of otolith samples collected in the SIOFA CA.

3. Discussion

WEST

- Sawada and Okuda (2020) have limited samples in age and depth ranges which likely underestimate the growth curve.
- Santamaria *et al* (2006) have limited sample size (n=) in age (less old age group), sampling period (only 3 months), the age range and depth (less samples from the shallow water range), which likely makes the equation unreliable, although the growth curve itself is likely plausible as it is close to the one by Brouwer *et al* (2020).
- Ivanin and Rebyk (2012) have limited sample sizes (n=) in age (less older ages) and depth (less samples from the deeper range). The original equation is based on SL (standard length) and the equation is converted to FL using the conversion factor $FL=SL/0.92$. The $L_{\infty}=72.7\text{cm}$ is close to the one (69.2cm) by Brouwer *et al* (2020). However, within the plausible maximum age 25, this growth curve is very fast (FL is too high) than all others, thus this equation is unlikely plausible.

Table 1 Comparisons of four growth equations in the SIOFA CA

All growth equations are derived by the von Bertalanffy model based on age estimated by otoliths from the SIOFA CA (see Map 1)				
color legend	more sample size (n=)		based on available information in the documents and/or the real data.	
	less sample size (n=)			
Authors	Sawada & Okuda	Santamaria et al.	Ivanin & Rebyk	Brouwer et al.
year reported	2020	2006	2012	2020
area (see map)	WEST(wide area)	WEST (2 spots)	WEST(wide area)	EAST (wide area)
Vessel (country)	Japan	Spain	Ukraine	Cook Islands+Australia
Trawl type	mid-water	mid and bottom	mid and bottom	mid and bottom
sample (n=)	407	195	392	397
sex	combined	separate (no significant diff ♂ vs ♀)	combined	combined
age	0-5	1-14	2-18	0-25
0 -5				
6-10				
11-15				
16-20				
21-25				
FL(cm)		16-44	12-55 (ave 27)	19-54
cross validation	?	yes	?	yes
period (sampling)	2016-2017	2001	1980-1988	2006-2017
	2 years	3 months	9 years	12 years
1980				
1984				
1988				
1992				
1996				
2000				
2004				
2008				
2012				
2016				
major depth range	400m	600-1,350m	200-800m	400-1,100m
> 400m				
400-600m				
600-800m				
800-1000m				
1000m <				
parameters estimated				
Loo	38.4	53.5	72.7	69.2
K	0.21	0.085	0.082	0.052
t0	-3.9	-4.3	-2.6	-6.1
note 1	samples limited to age 0-5	sample size (n=) small	The original equation is based on SL (Standard length, which is converted to FL in this table using the conversion factor FL=SL/0.92	no ♀samples (age > 10)
note 2	depth limited	sampling period too short		time-area-depth-size (age) range (well covered)

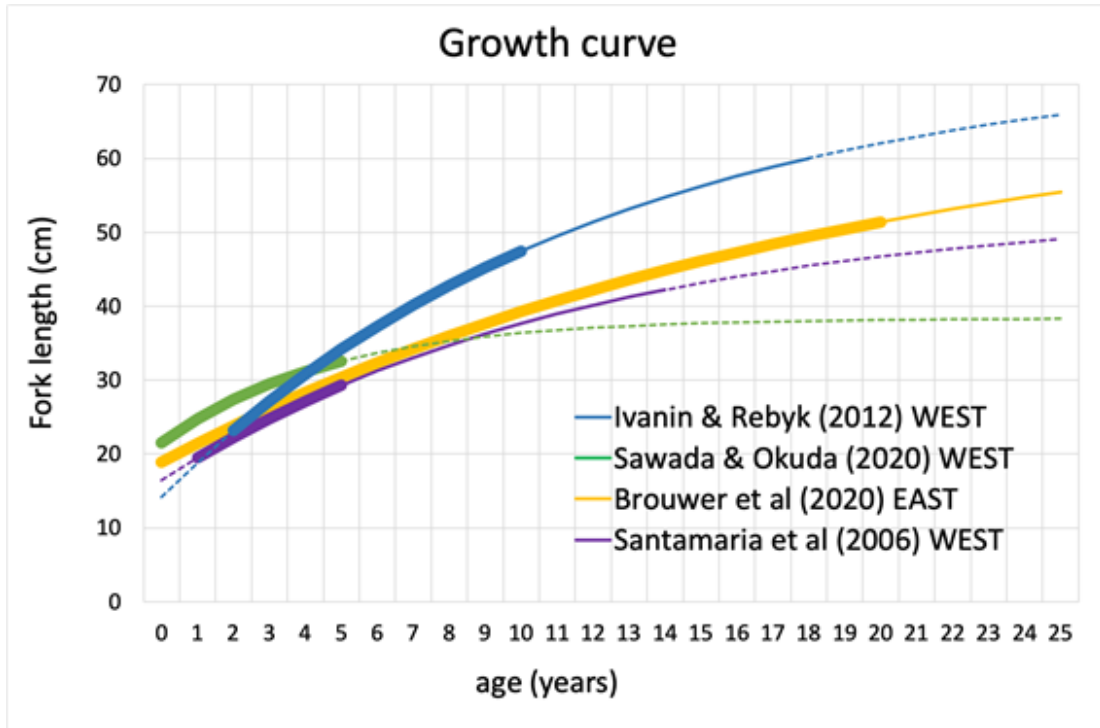
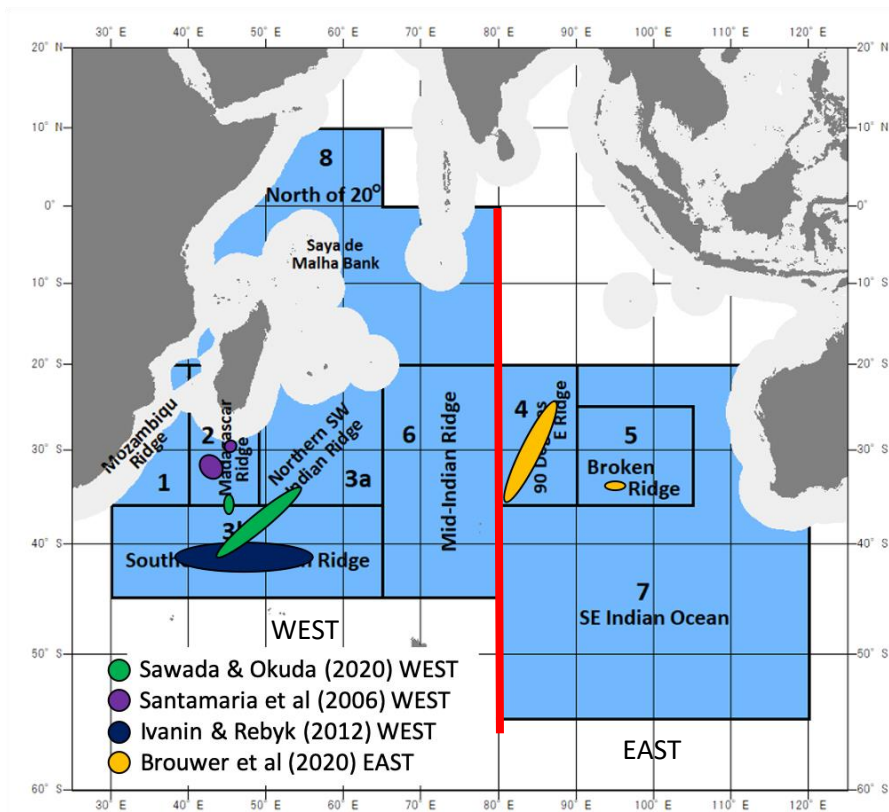


Fig 1 Comparisons of four growth curves in the SIOFA CA based on age estimated by otolith (sex combined)

- Solid line : samples are available
- Thick solid line : larger sample sizes (n=)
- Broken line : samples are not available



Map 1 Approximate locations of otoliths sampled and management unit (WEST and EAST)

EAST

- Brouwer *et al* (2020) covers the wider ranges of samples in age (except female age 10 or older), sampling period (years) and depths than all others, which make this equation most plausible among four growth equations in both WEST and EAST.

Growth equations by sex

- All documents suggested that there are non-significant differences in the growth equations between males and females. Santamaria et al (2006) actually conducted the Hotelling T²-test which resulted statistically non-significance.

4. Suggestions

- Sex combined growth equations can be used for stock assessment because there are no significant different in both equations between sexes.
- All three growth equations (curves) in WEST are unlikely plausible, while Brouwer *et al* (2020) in ESAT is likely the most plausible. Thus, it is considered that Brouwer *et al* (2020) may be useful for stock assessment for both WEST and EAST.