Technical repport: validation of anal spine method for ageing swordfish

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Introduction

The reunionese longline research program, conducted by Ifremer from 1996 to 2001, suggested a growth model for South West of Indian Ocean swordfish. The first hypothesis was that visible rings on swordfish anal spine sections were annual growth rings. This hypothesis had to be confirmed. The most conclusive method was to use oxytetracycline injection in addition to conventional tagging and recapture the swordfish again. But it is an expensive method in terms of time and staff (you have to tag many fish to be lucky to recapture one of them), so we went another way, like marginal increment study.

Methods

During the Réunion longline program, a lot of swordfish anal spines have been collected from 1998 to 2001 and cut up. The sections which present clear growth rings were selected and all the others were eliminated. Eventually, only 274 spine sections were kept. The focus – growth ring distances were measured and recorded for each of them using image analysis Visilog-TNPC software. For each section, marginal growth increment has been calculated as the difference between the spine section radius and the distance from focus to the outermost growth ring (Ehrhart,1992):

$M.I. = (R_c - r_n)$

R_c = spine radius
r_n = most recent growth ring radius

To accommodate large marginal increment variability within ages, relative marginal increment was calculated:

$R.M.I. = (R_c - r_n) / (r_n - r_{n-1})$

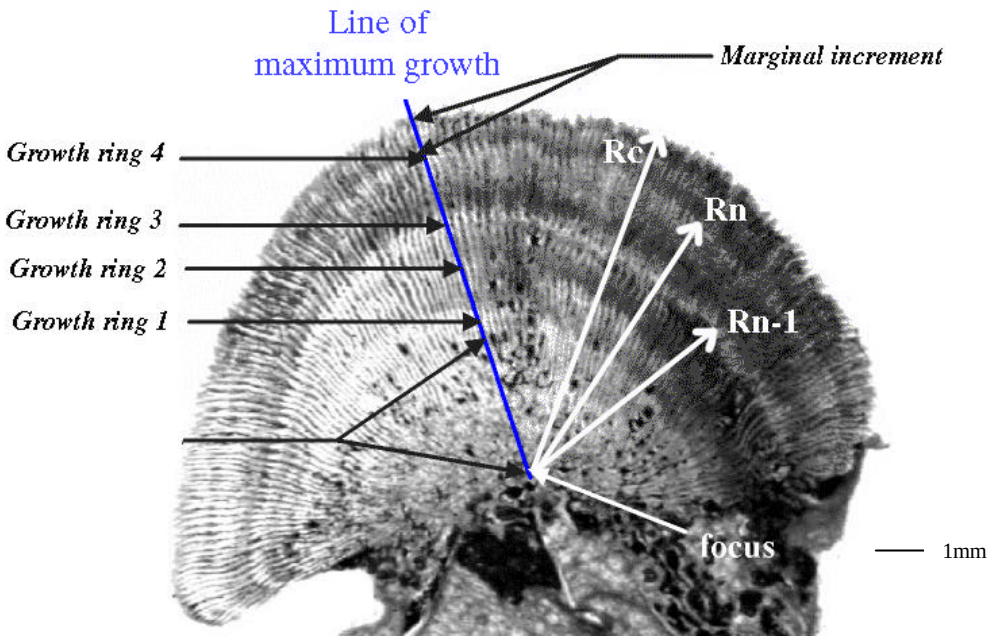


Figure 1. Swordfish anal spine section

Results and discussion

M.I. and R.M.I. were calculated for each sex anf for 3 periods of the year (March, Mai and December): the number of clear sections was not sufficient in other sampling periods to have indicative results.

The average M.I. and M.I.R. and standard deviation intervals are so highly variable that no noticeable trend can be observe.

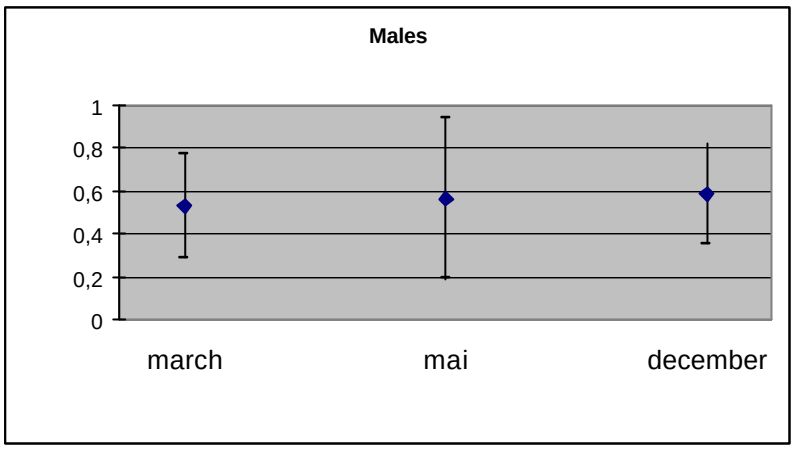
Figure 3 presents trends during 3 periods of marginal growth increment at each age for male and female swordfish.

These results don't allowed us to confirm the hypothesis of annual growth rings. Another way of validation has to be used such as tagging methods or other ageing methods.

MI (Marginal Increment)	Male swordfish (n=103)		Female swordfish (n=171)		Total swordfish (n=274)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Mars	0.281	0.168	0.295	0.159	0.289	0.163
Mai	0.262	0.137	0.192	0.085	0.210	0.104
Décembre	0.204	0.136	0.207	0.140	0.205	0.138

RMI (Relative Marginal Increment)	Male swordfish (n=103)		Female swordfish (n=171)		Total swordfish (n=274)	
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation
Mars	0.532	0.243	0.558	0.313	0.548	0.286
Mai	0.568	0.374	0.842	0.406	0.771	0.412
Décembre	0.590	0.237	0.543	0.235	0.566	0.234

Tab. 1 : Marginal Increment (MI) and Relative Marginal Increment (RMI)



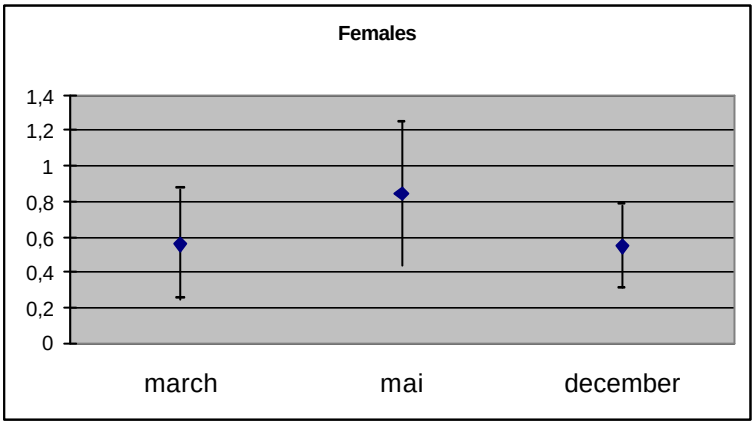
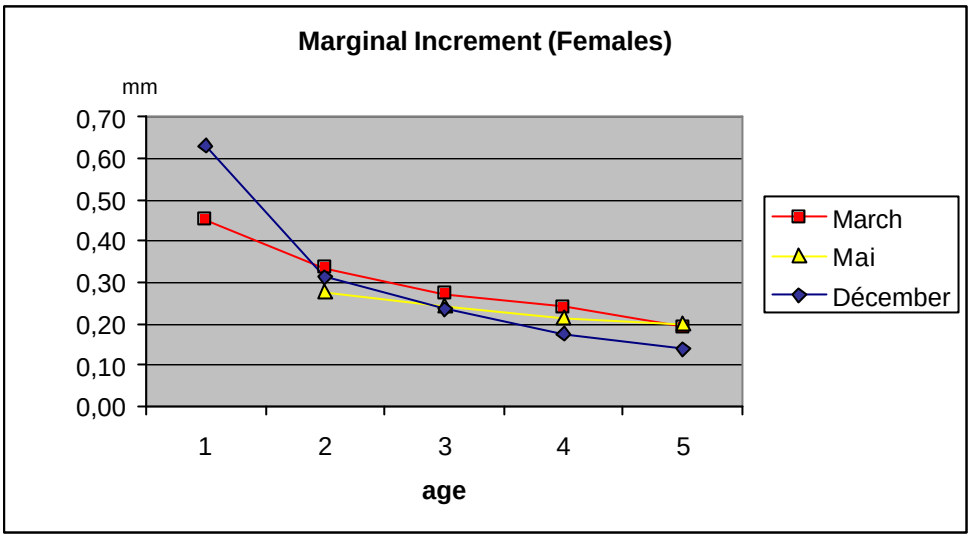


Figure 2. Mean Marginal Increment Ratio for female and male swordfish



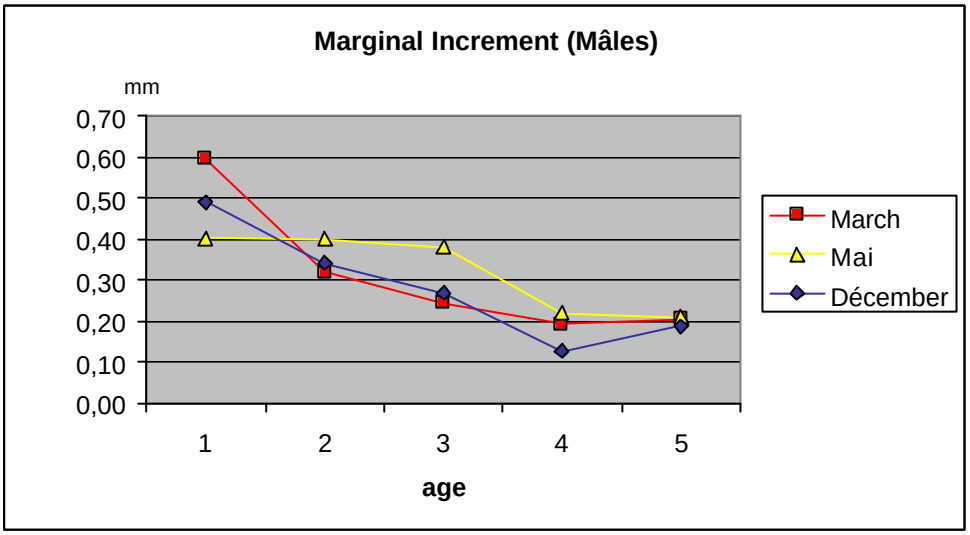


Figure 3. Mean marginal increment by age for male and female swordfish