Supplementary material

Changes in environmental salinity during the life of *Pangasius krempfi* in the Mekong Delta (Vietnam) estimated from otolith Sr : Ca ratios

Ngan T. Tran[A,C], *Maylis Labonne*[B], *Huy D. Hoang*[A] *and Jacques Panfili*[A,B]

[A]Vietnam National University Ho Chi Minh City–University of Science, 227 Nguyen Van Cu, District 5, Ho Chi Minh City, Vietnam.

[B]Marine Biodiversity, Exploitation and Conservation (MARBEC), Institut de Recherche pour le Développement (IRD), Institut Français de Recherche pour l'Exploitation de la Mer (Ifremer), Université de Montpellier (UM), Centre national de la recherche scientifique (CNRS), cc093, Place E. Bataillon, F-34095 Montpellier, France.

[C]Corresponding author. Email: ttngan@hcmus.edu.vn

Paired translucent and opaque bands on the otolith sections were assumed to be annual (Panfili *et al*. 2009) and this was verified, but not validated, using the distribution of the increments between the samples. One year was assumed to be between the beginning of one translucent band and the end of the next opaque band (Morales-Nin and Panfili 2002). A one-way ANOVA was used to compare the means of each increment between the assumed years. The growth of the collected individuals was estimated using the standard von Bertalanffy growth model:

$$TL_t = TL_\infty \times [1 - e^{-K(t-t_0)}]$$

where TL_t is the total length (mm) at age t (years), TL_∞ is the predicted asymptotic total length, K is a growth coefficient and t_0 is the age when the total length is zero. The model was fitted using the Levenberg–Marquardt nonlinear least-squares estimation method (Marquardt estimation) and Statistica.

The number of pairs of increments was taken to be the number of years, verified using the increment (Fig. S1) showing fast growth during the first 2 years: 413.2 ± 48.9 µm ($n = 25$) for the first year and 260.1 ± 7.5 µm ($n = 23$) for the second. After the second year, the increments decreased from 188.8 ± 60.6 µm ($n = 17$) for the third year to 150.0 ± 15.3 µm ($n = 3$) for the fifth year (Fig. S1). The otolith growth was highest in the first year for 96% of the individuals being between 32 and 75% of the total otolith growth. There were significant differences between the first and second years and the following years ($F = 46.86$, $P = 0$) but no significant differences between the third and subsequent years ($P > 0.05$, Fig. S1). Statistical testing of the increments showed that the conversion of increments to years was justified and robust. The growth curve was modelled using the following von Bertalanffy growth function (Fig. S2):

$$L_t = 775.14 \times [1 - e^{-0.88(t-0.67)}]$$
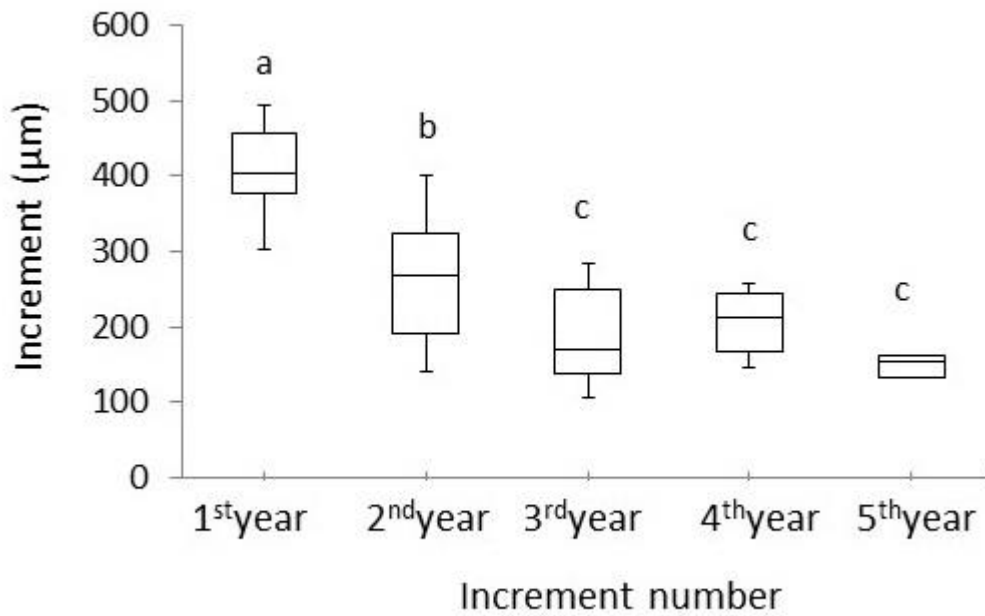
with $R^2 = 0.86$

Fig. S1. Boxplot of median, interquartile range and range of increments for *Pangasius krempfi* otoliths (mean ± s.d.) for each year. Increments with the same letter are not significantly different (ANOVA, *P* < 0.05).
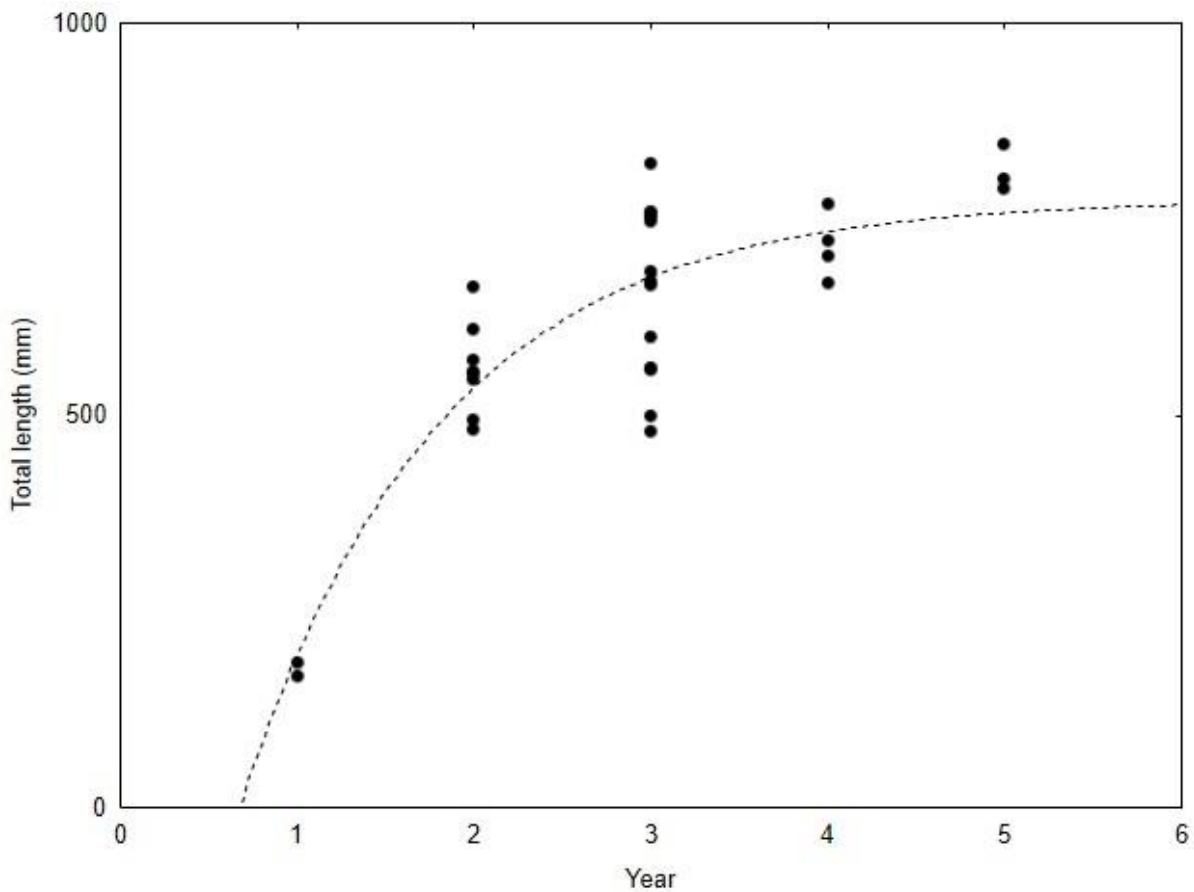

Fig. S2. von Bertalanffy growth model for *Pangasius krempfi* collected in the Mekong Delta (least-squares fit, $R^2 = 0.86$). $L_t = 775.14 \times [1 - e^{-0.88(t-0.67)}]$
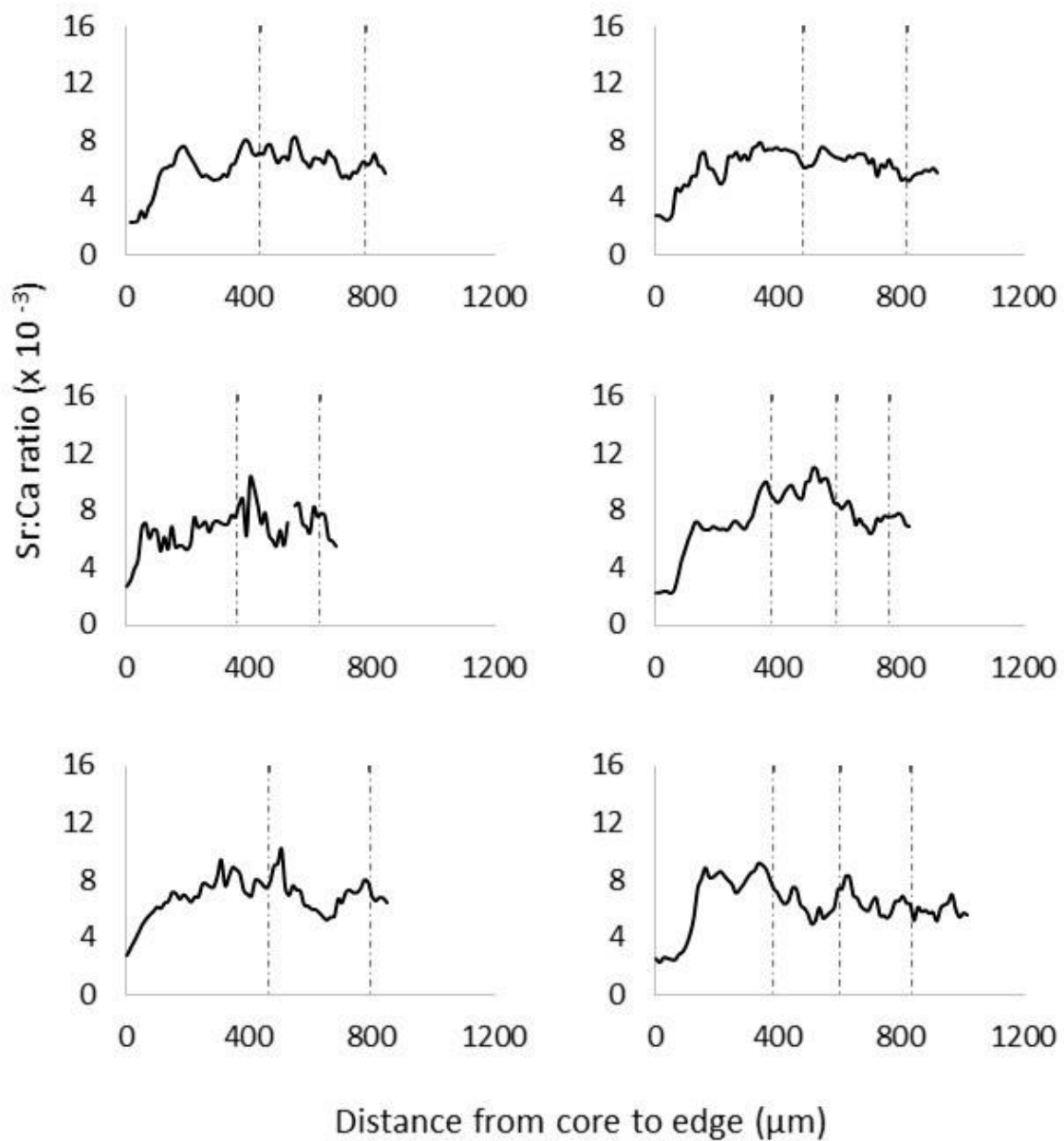
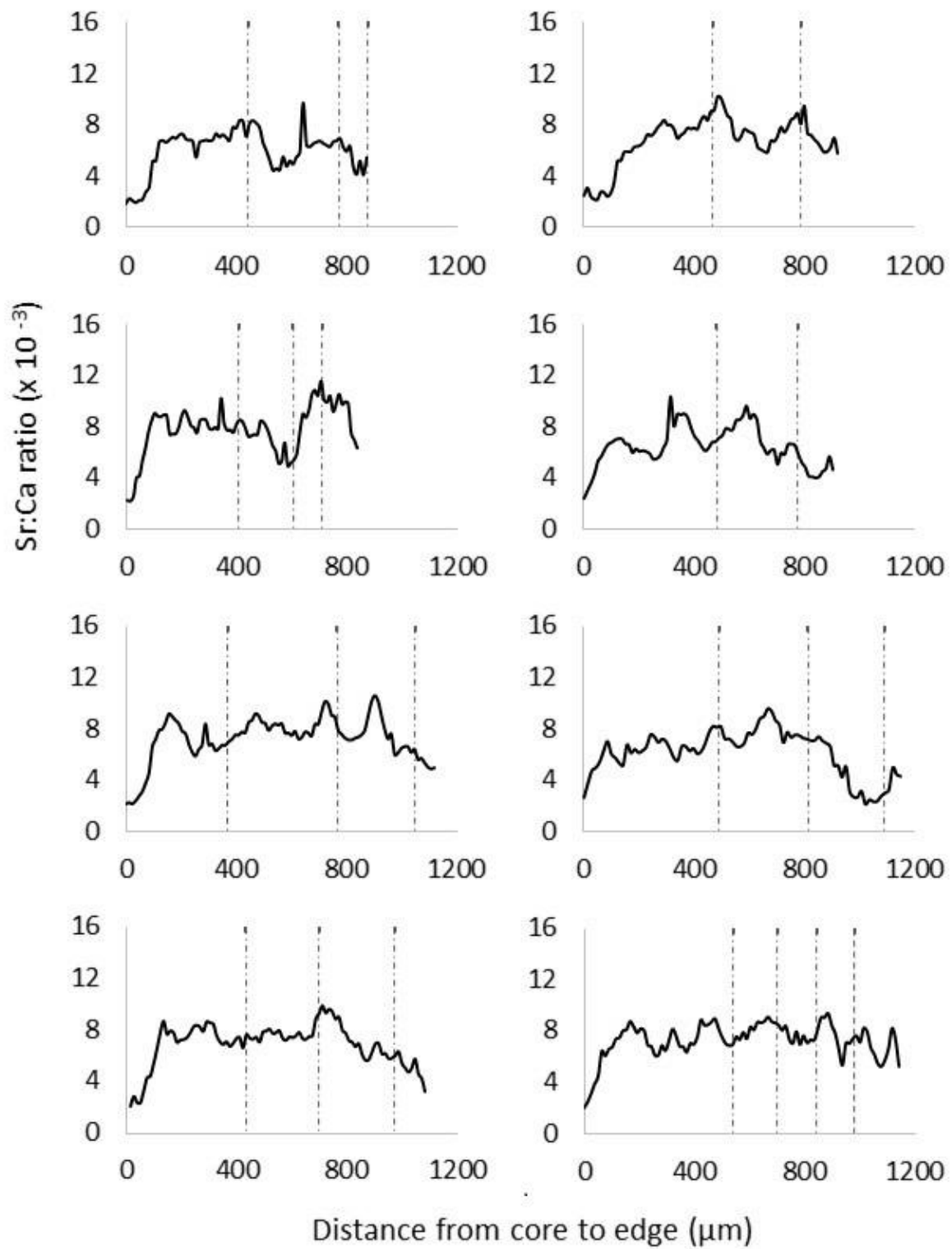**Fig. S3.** Sr : Ca otolith profiles from the core to the edge for all sampled *Pangasius krempfi*.
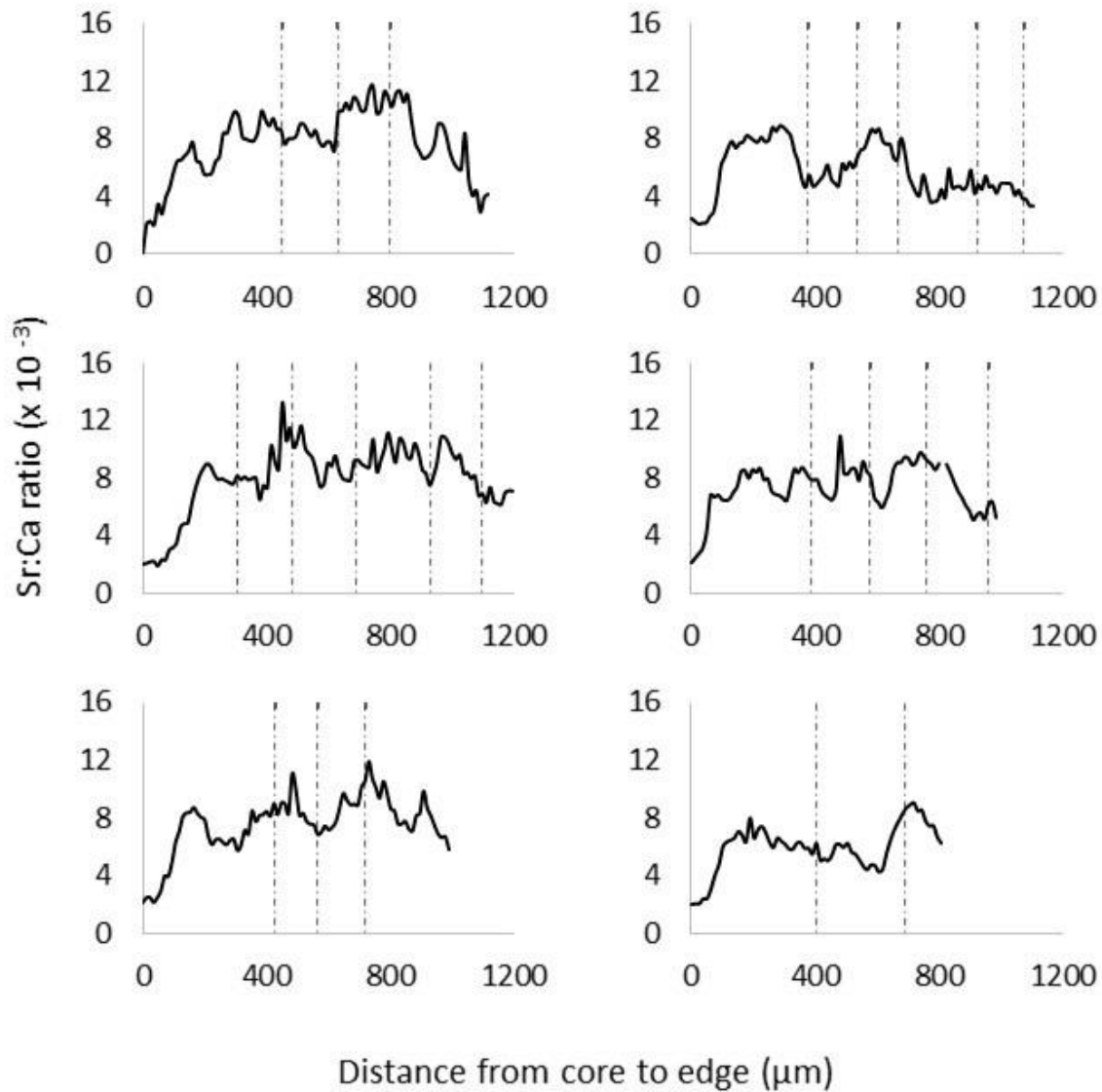
Fig. S3. *(Cont.)*

Fig. S3. *(Cont.)*

References

Morales-Nin, B., and Panfili, J. (2002). Verification. In 'Manual of Fish Sclerochronology'. (Eds J. Panfili, H. Pontual, H. Troadec, and P. J. Wright.) pp. 138–142. (Éditions Ifremer and IRD Éditions: Brest, France.)

Panfili, J., Tom, Á. S. J., and Morales-Nin, B. (2009). Otolith microstructure in tropical fish. In 'Tropical Fish Otoliths: Information for Assessment, Management and Ecology'. (Eds B. S. Green, B. D. Mapstone, G. Carlos, and G. A. Begg.) pp. 212–248. (Springer: Dordrecht, Netherlands.)