

Supplementary Material

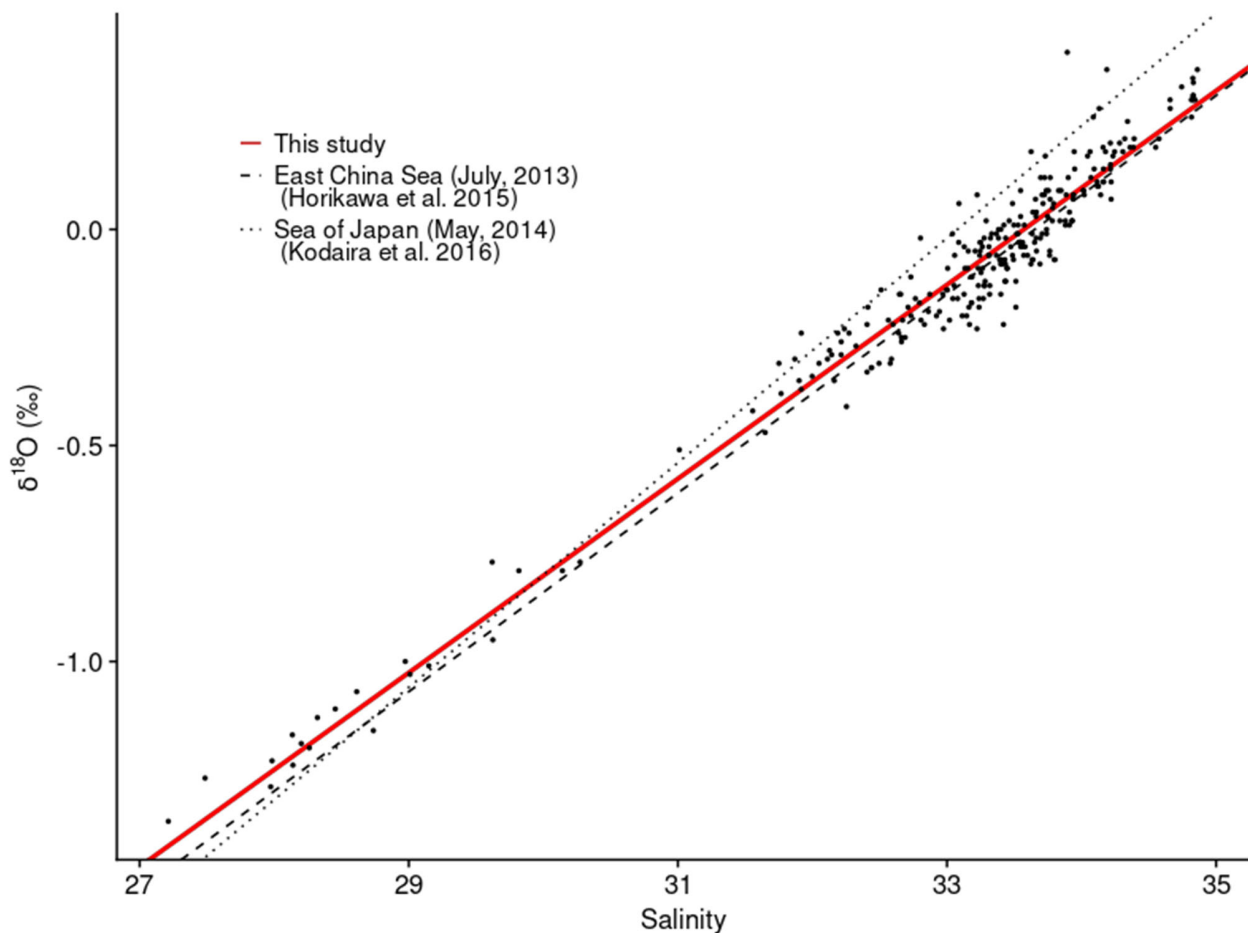
1 Supplementary Tables and Figures

1.1 Supplementary Tables

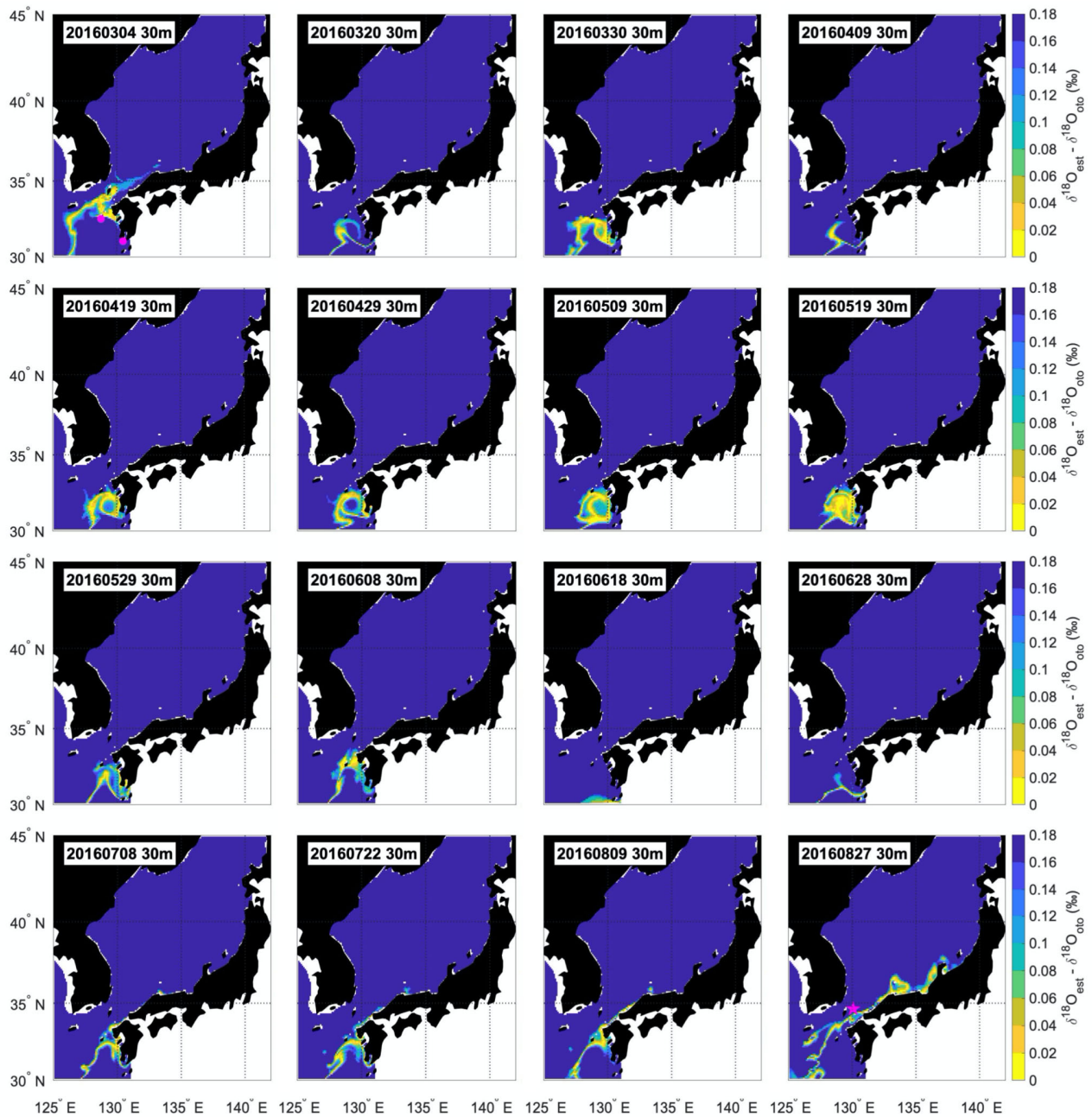
TABLE S1. Summary of analytical results for all individuals analyzed for stable isotope analysis is available from doi: 10.6084/m9.figshare.25241842 after the article is accepted.

1.2 Supplementary Figures

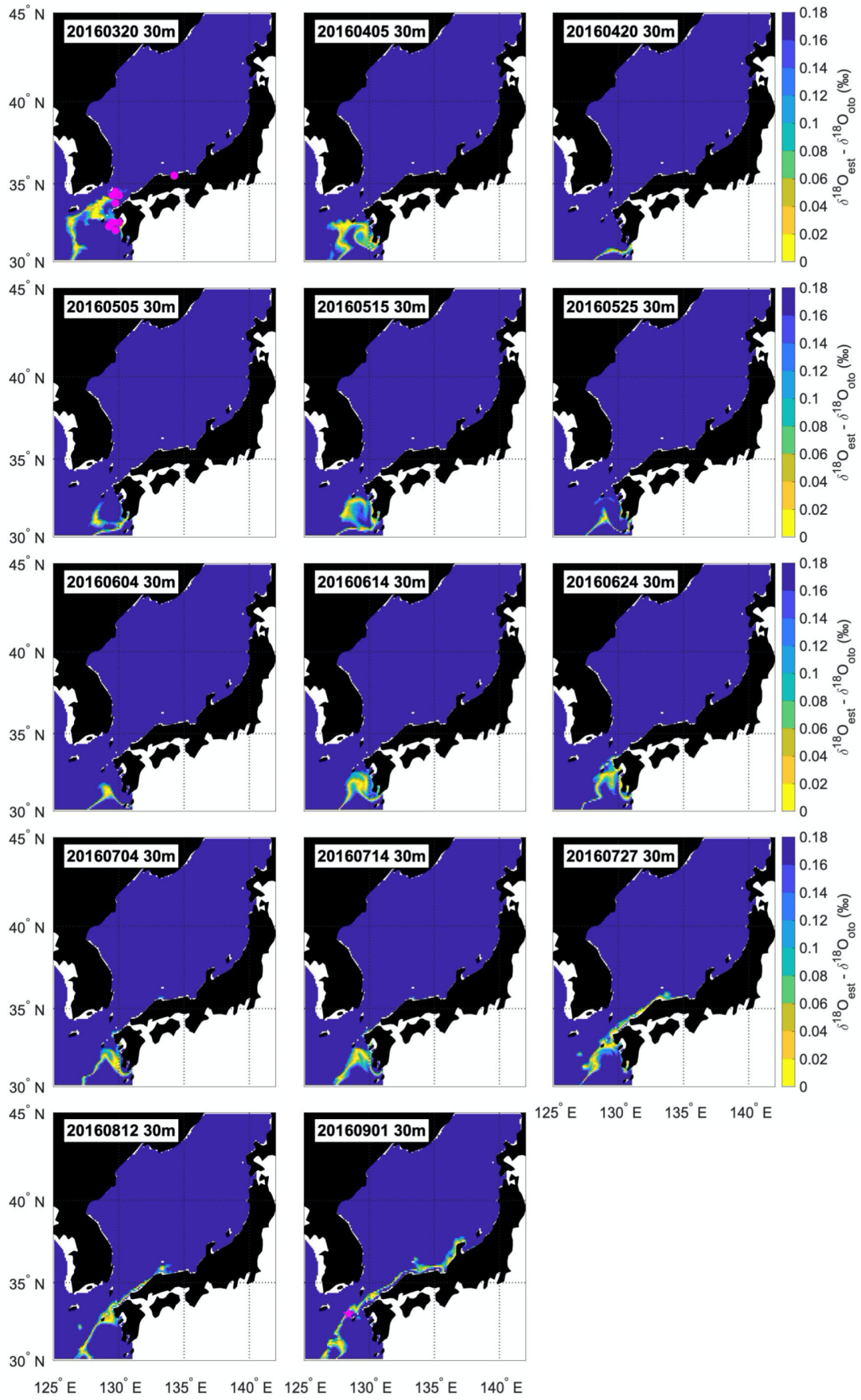
Supplementary video 1. An example of otolith milling process in a one-year-old Japanese sardine collected in the Sea of Japan. The distance from the core to the edge of this otolith was 1428 μm . This is not the sample used in this study, but is shown here as an example. Double-click on the image to play it.



Figures S1. Comparison of $\delta^{18}\text{O}_{\text{water}}$ and salinity in the Sea of Japan. Filled circles indicate the measured values in this study. The solid red line shows the relation of this study, the dashed black line shows the relation of Horikawa et al. (2015), and the dotted black line shows the relation of Kodaira et al. (2016).



Figures S2. Example of estimated distribution areas of the individual collected in Tsushima Strait in 2016 (Tsushima Strait_2016_1), assuming the distribution depth of 30 m. The blue to yellow gradation indicates the estimated distribution areas. Spawning grounds are presented as pink circles. Sampling area is presented as pink star. The upper leftmost figure shows the estimated distribution area of the nearest hatching date and the lower rightmost figure shows the estimated distribution area of the nearest sampling date.



Figures S3. Example of estimated distribution areas of the individual collected off Goto Islands in 2016 (Off Goto Islands_2016_1), assuming the distribution depth of 30 m. The blue to yellow gradation indicates the estimated distribution areas. Spawning grounds are presented as pink circles. Sampling area is presented as pink star. The upper leftmost figure shows the estimated distribution area of the nearest hatching date and the lower rightmost figure shows the estimated distribution area of the nearest sampling date.

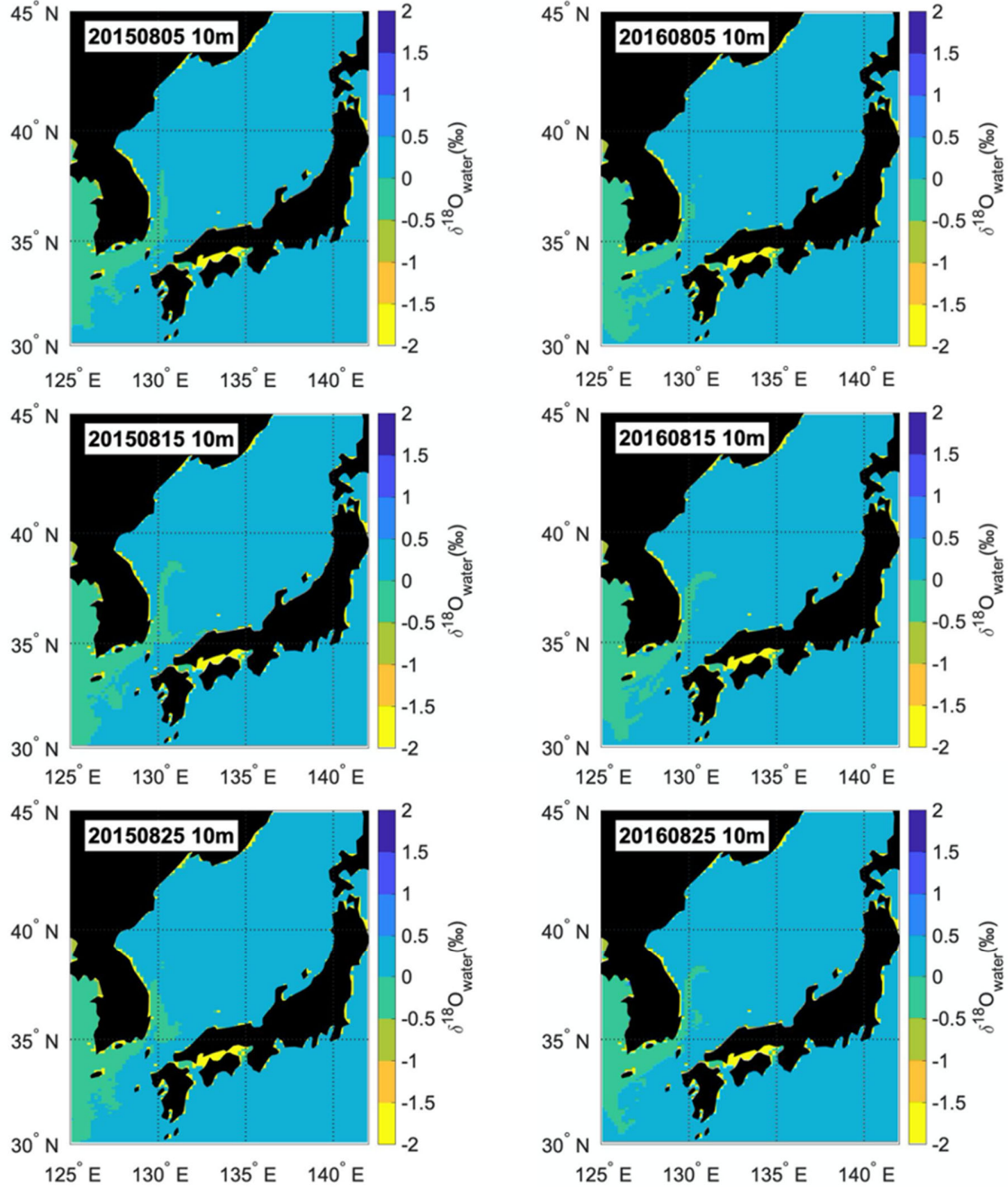


Figure S4. Spatial distribution of $\delta^{18}\text{O}_{\text{water}}$ in the Sea of Japan at a depth of 10 m in summer. $\delta^{18}\text{O}_{\text{water}}$ is calculated by substituting the salinity field of FRA-ROMS into equation (2). The date of the calculation is shown in the upper left corner of each panel. The left column shows the results for 2015 and the right column shows the results for 2016.