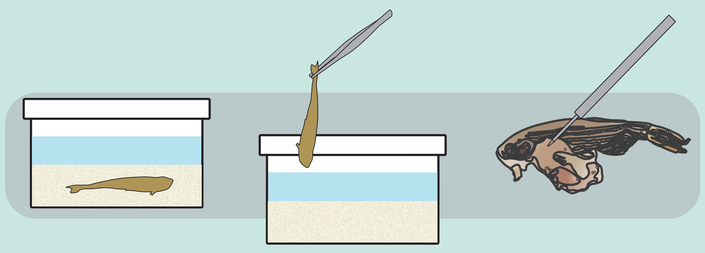
# CT scanning as a non-invasive visualisation technique for sediment-based decay experiments

**Iacopo Cavicchini**[1], Paul F. Wilson[2], Sam Giles[1], and Thomas Clements[1]

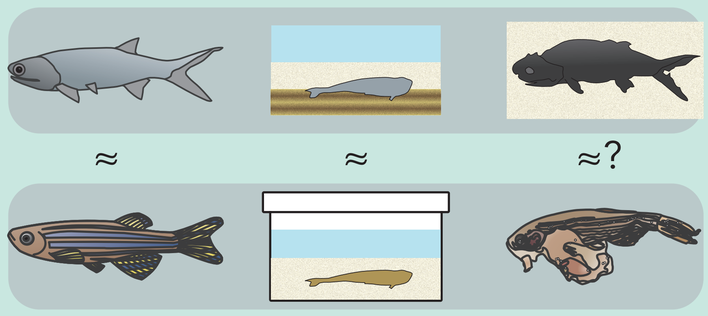
1: School of Geography, Earth and Environmental Sciences, University of Birmingham, UK.

2: Warwick Manufacturing Group, University of Warwick, UK.

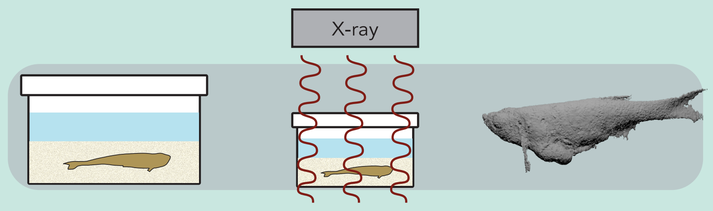
**1.** Traditional decay experiments carcasses **must be exhumed and dissected to collect data** on the decay of morphological (anatomical) characters.




**2.** Decay experiments investigate the loss of biological information during post-mortem processes. **Any additional loss of information induced by the extraction process may skew our understanding of the process.**



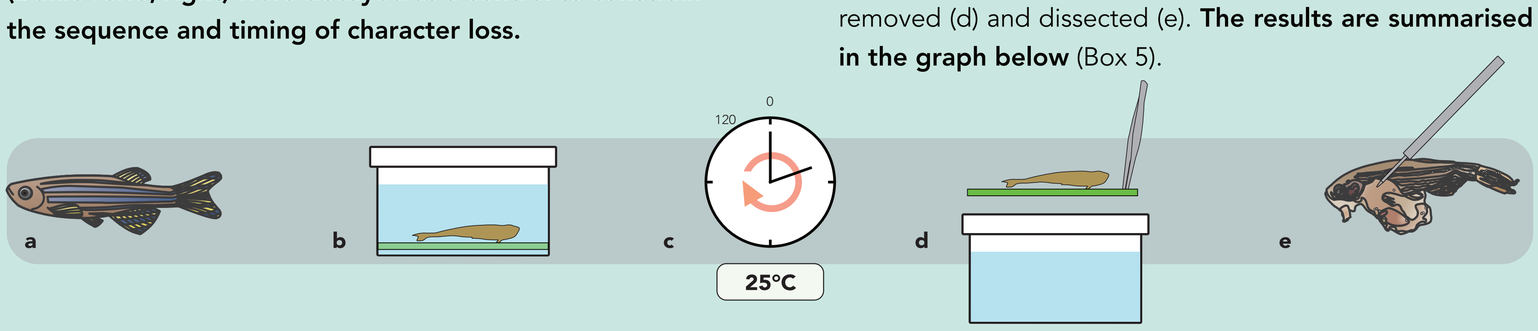

**3.** X-Ray Computed Tomography (XCT scanning)* is a non-destructive imaging technique. We present a proof of concept study investigating the feasibility of this technique to obtain **non-destructive sampling decay data from zebrafish buried *in situ*.**




## 4. METHODS

It is currently unclear if X-ray exposure can harm bacterial communities and influence the decay process. **48 zebrafish (*Danio rerio*, right) were decayed as a control to constrain the sequence and timing of character loss.**

The zebrafish (a) were put in individual plastic jars filled with 100mL of deionised water, with a plastic mesh on the bottom to facilitate extraction (b), then left inside a maturation chamber at 25°C and sampled over 120 days (c) by being removed (d) and dissected (e). **The results are summarised in the graph below** (Box 5).




### ZEBRAFISH IDENTIKIT

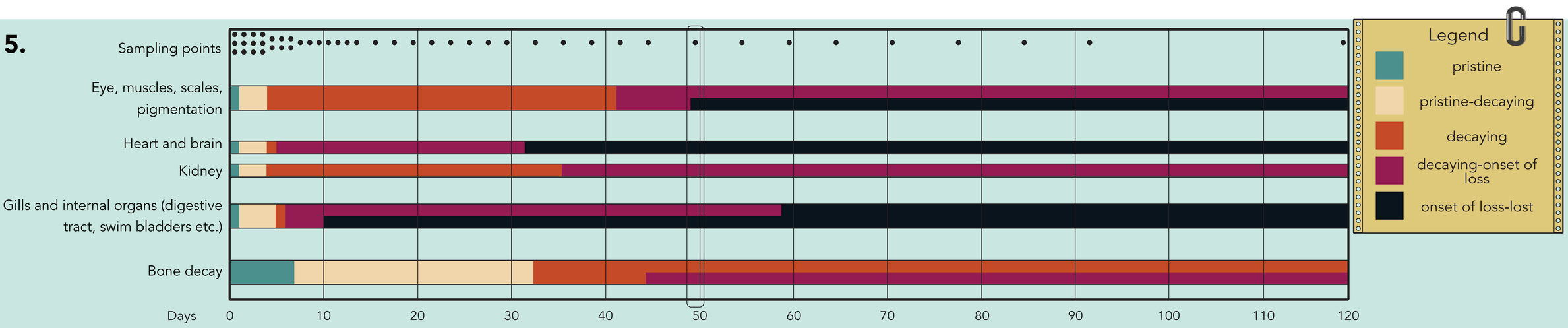
*Danio rerio*

A 2 to 5 cm long cyprinid fish from South-East Asia.

Common model organism for all sorts of research.

Supplied and euthanised by the University of Birmingham Biology department, in compliance with the University of Birmingham ethical regulations.

**5.**

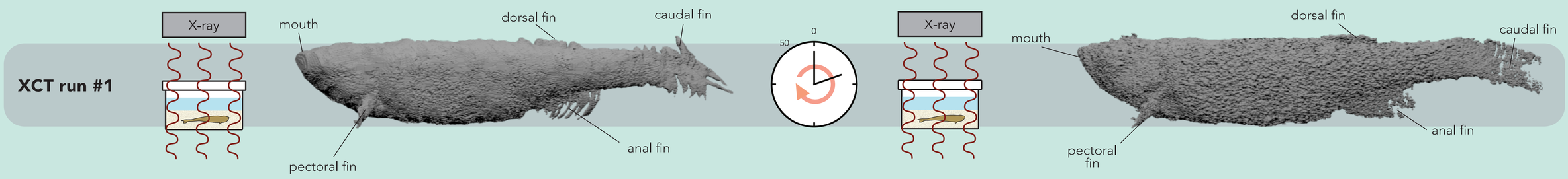


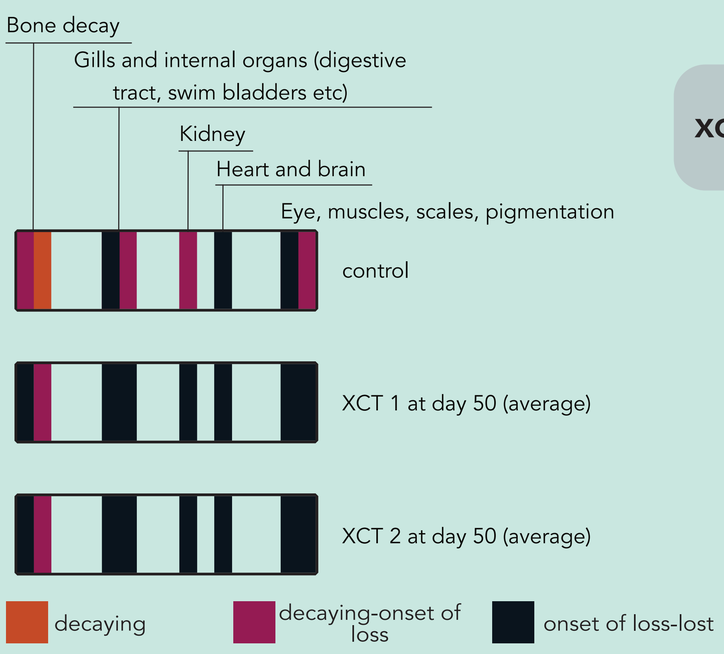

**6.** To investigate the impact of XCT scanning on decay, we scanned a total of 10 zebrafish. The first 4 were scanned on day 0 and again after 50 days (XCT run #1); 4 more were scanned only on day 50 (XCT run #2). The zebrafish were prepared in the same way as the control, but were buried in quartz sand to prevent them from floating during the scans.

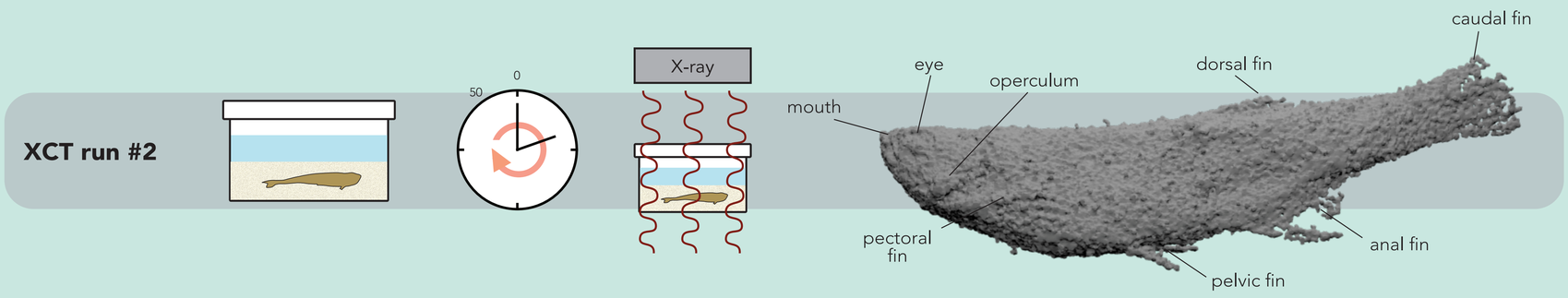
The fish were exhumed after scanning on day 50 and dissected, to assess their decay state (bottom left).

We compared the 3D models and decay state of XCT run #1 and XCT run #2, then further compared with the control group decay state at day 50.

Meet the rest of the 3D scans with the rotten zebrafish!




## 7. RESULTS

Our preliminary results show that exposure to X-rays from XCT scanning has little to no impact on decay rate or the sequence of character loss, although decay appears faster than the control in water (left).

Current controls in sand will be undertaken to ascertain if it is caused by the presence of sediment.

Our experiment confirms that XCT scanning is an effective approach to non-destructive visualisation of a decay experiment in sediment. At the XCT resolution utilised in this study, we were unable to resolve internal anatomy, however, this is part of further work we are undertaking.

*The X-Ray Computed Tomography (XCT) data used in this article was acquired using the Free-at-Point-of-Access scheme at the National Facility for X-Ray Computed Tomography (NXCT) and carried out at the Centre for Imagine, Metrology, and Additive Technologies (CiMAT) at the University of Warwick under the EPRSC Project Number (EP/T02593X/1).