**Supplementary material**

Figure 1: Semi-quantitative analysis of the resin (top panel) and of the illicium (bottom panel) determined using energy dispersive X-ray spectroscopy (EDS) and scanning electron microscopy. Resin was characterized by the presence of C and O at high levels, and traces of other elements; whilst the illicia were characterized by the presence of C, O, P and Ca at high levels, and F, Na, and Mg at lower levels. This conformed that illicia and resin spectra are very different allowing for a good quantification of illicia composition by LA-ICPMS.





Figure 2: 23Na, 24Mg, 31P, 43Ca and 44Ca profiles for analysis of laser spots with 10 (a), 25 (b), and 40 (c) µm diameter beam sizes. The remaining elements showed the same pattern (not included to improve plot visualisation). Note that for 10 µm spots the signal intensity rapidly decays, impeding good quantification of the different isotopes due to signal instability; furthermore, signal intensity of smaller spots is much lower than that obtained for 25 and 40 µm spots making some minor elements unquantifiable (not represented). Although the signal intensities for the 25 µm spots are around 10 times lower than those obtained for 40 µm spots, they are adequate for trace elements quantification and provide better spatial resolution.



Figure 3: Relationships between the natural log of fish length and the natural log of otolith radius (top) and between fish length and illicium diameter (bottom).





Figure 4: Plot of mean temperatures in the water column at three depth intervals from across the study area (48° to 54° latitude; -15° to -4° longitude). Grey points represent the depth averaged mean for each 1° grid square; red points represent the mean across the entire study area. Temperature data were obtained from the Met Office Hadley Centre observations datasets version EN.4.2.1 (Goodet al., 2013), applying the temperature corrections of Gouretski and Reseghetti (2010) (<https://www.metoffice.gov.uk/hadobs/en4/download-en4-2-1.html#g10_profiles>; downloaded 15/01/2021).



Table 1: Summary of literature sources pertaining to the analysis of trace elements in fin spines and vertebrae.

| **Species** | **Structure** | **Analytical method** | **Elements** | **Context** | **Reference** |
| --- | --- | --- | --- | --- | --- |
| *Acipenser fulvescens* | pectoral fin rays | LA-ICPMS | Sr  | chemical marking of juveniles using water enriched with 86SrCO3 | Smith and Whitledge, 2011 |
| *Acipenser guldenstadti* | pectoral fin rays | X-ray microprobe | Sr, Ca | Reconstruction of migratory histories | Arai et al., 2002 |
| *Acipenser medirostris* | pectoral fin rays | LA-ICPMS | Sr, Ba, Ca | Tracing freshwater/marine transitions in experimentally reared and wild fish  | Allen et al., 2009 |
| *Acipenser transmontanus* | pectoral fin rays | LA-ICPMS | Sr, Ca | Concentrations compared between growth zones to infer estuarine and river occupancy  | Veinott etal., 1999 |
| *Carcharhinus leucas, C.amboinensis* | vertebrae | LA-ICPMS | Li, Mg, Al, P, Ca, Mn, Fe, Cu, Zn, Sr, La, Ba, U | Inferring habitat use and movement between nursery and adult areas | Tillett etal., 2011 |
| *Chasmistes liorus* | pelvic fin ray | LA-ICPMS | 87Sr/86Sr | Discriminating stocked and wild fish | Wolff etal., 2013 |
| Chinese Carp  | vertebrae, flesh, liver | ICP-OES + Flame Atomic Absorption for Hg | As, Cd, Pb, Hg | Incorporation of heavy metals in waste water into bone and tissue (field and lab experiments)  | Feldlite etal., 2008 |
| *Esox masquinongy* | pelvic fin ray | LA-ICPMS | Sr, Ca | Discriminating stocked and wild fish | Rude etal., 2014 |
| *Micropterus dolomieu* | pectoral fin rays | LA-ICPMS | Ca, Sr, Ba | Reconstructing environmental history from core and edge analysis of fin rays | Smith and Whitledge, 2010 |
| *Pagrus auratus* | dorsal spines | ICPMS | 86Sr | Experimental marking with SrCl2 incorporation at different concentrations | Pollard etal., 1998 |
| *Parma microlepis* | otoliths, eye lenses, scales, spines | ICPMS | Mn, Sr, Ba, Pb | Correlation in concentrations between tissues | Gillanders 2001 |
| *Pristis pectinata* | vertebrae | LA-ICPMS | Ca, P, Sr, Ba | Examined variation in trace element concentrations across opaque and translucent bands for age validation. Ca and P highly variable between bands, Sr/Ca varied with bands in relation to river salinity | Scharer et al., 2012 |
| *Salmo salar* | vertebrae | ICPMS | Sr | Tracing river origin using Sr in otoliths, scales and vertebrae  | Kennedy et al., 2000 |
| *Salvelinus alpinus* | opercula | GFAAS | Pb | Contribution of age and water chemistry to variability of Pb in otoliths and opercula | Köck et al., 1996 |
| *Scaphirhynchus* spp. | pectoral fin rays | LA-ICPMS | Sr, Ca | Influence of water chemistry on Sr:Ca in fin rays | Phelps et al., 2012 |
| *Scyliorhinus canicula* | up to 8 tissues depending on species | AAS | Cu, Mn, Fe, Cd, Ni, Pb, Zn | Comparison between 46 species from inshore and offshore habitats | Vas, 1991 |
| *Thunnus alalunga* | otoliths, first dorsal spine | LA-ICPMS | Mn, Ba, Mg, Sr | Differences between opaque and translucent bands in natural concentrations and in uptake of post-mortem contamination | Davies et al., 2011 |
| *Thunnus thynnus, T. alalunga* | first dorsal spine | ICPMS | B, Mg, Al, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Rb, Sr, Y, Pd, Cd, Ba, La, Ce, Ir, Hg, Pb | Comparison of concentrations in muscle and bone as an indicator of bioaccumulation  | Ugarte et al., 2012 |
| *Thunnus thynus* | first dorsal spine | LA-ICPMS | Sr, Ba, Mg, Mn, Li, Co, Pb, Ni, Cu, Zn, Ca | Investigation of differences in concentrations between opaque and translucent bands, relationship between concentrations and age Effects detected for Sr, Ba, Mn, Zn, Cu | Luque et al., 2017 |
| *Thymallus arcticus* | pectoral fin spines | LA-ICPMS | Sr, Ba, Mn | Comparison of concentrations in otoliths and scales and relationships with water chemistry | Clarke et al., 2007 |