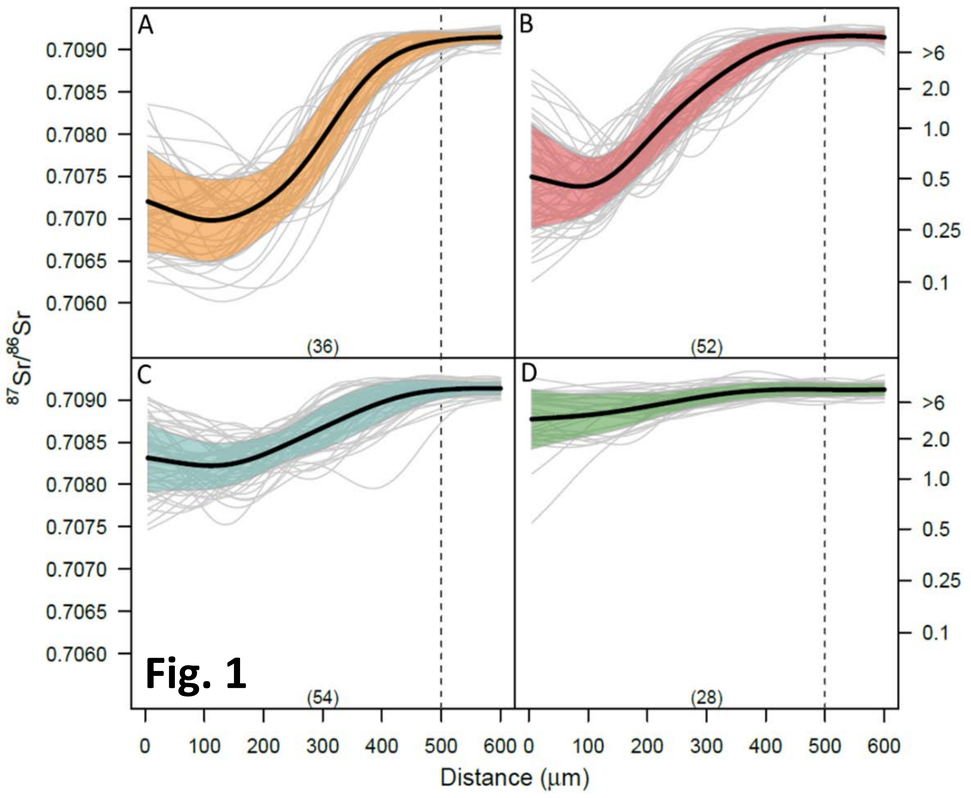


Fig. 1

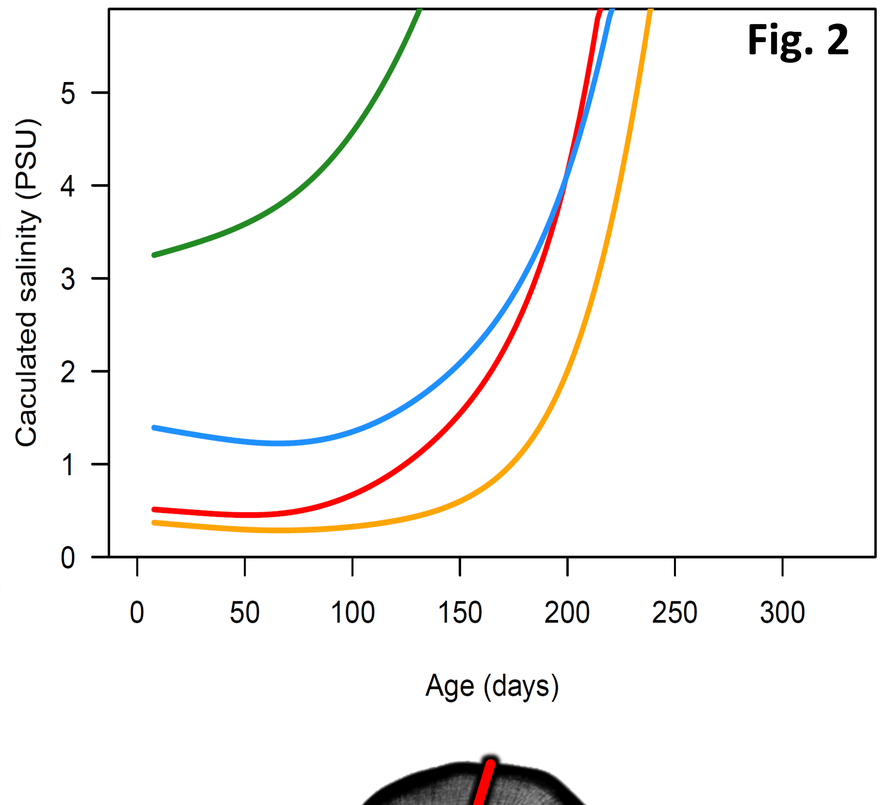
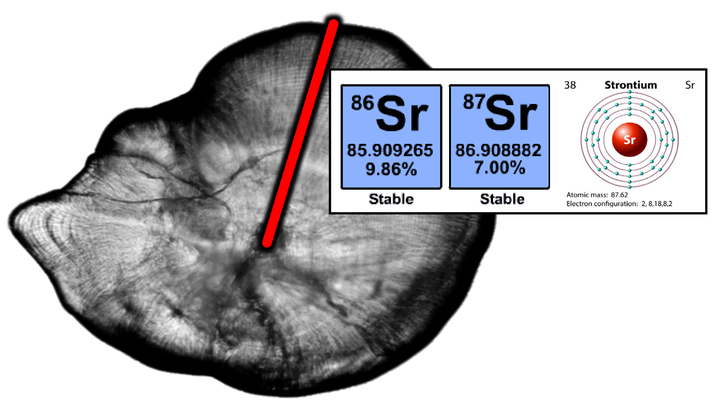


Figure 1: Strontium isotope analyses of Longfin Smelt otoliths, categorizing four distinct clusters (A-D) of larval and juvenile individuals migrating out of the low salinity zone (~ 6 psu) at separate time intervals.

Figure 2: Low salinity profiles calculated from strontium isotope analyses in larval and juvenile Longfin Smelt otoliths, estimating timing of migration in days post hatch. Each line color corresponds to individual clusters in of salinity profiles in Figure 1.



Multiple geochemical tracers indicate variation in larval and adult Longfin Smelt life histories

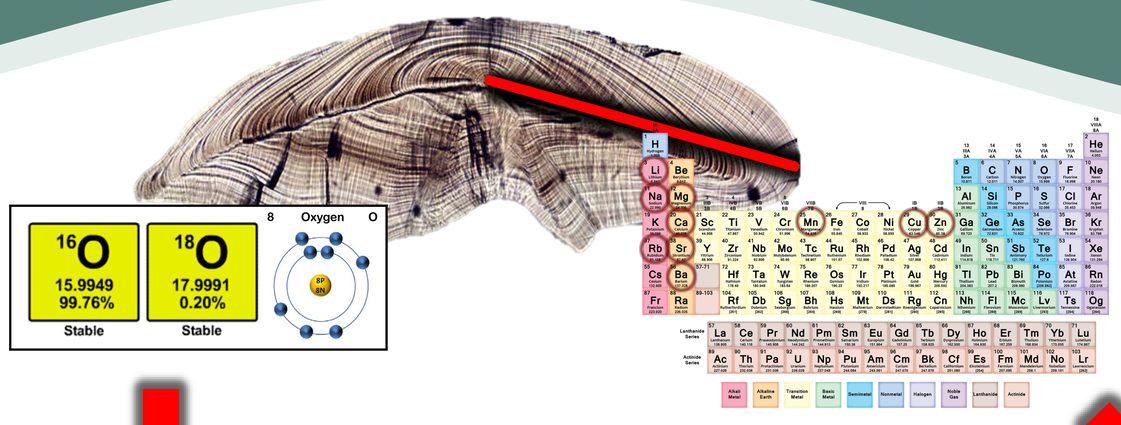
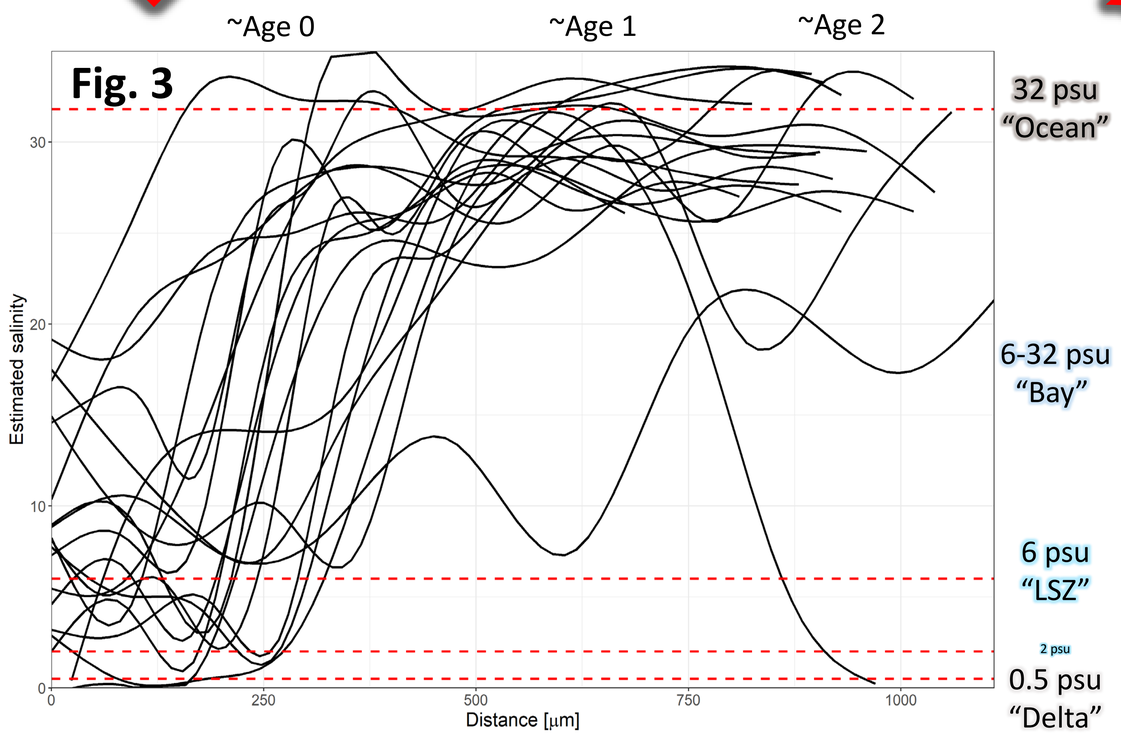
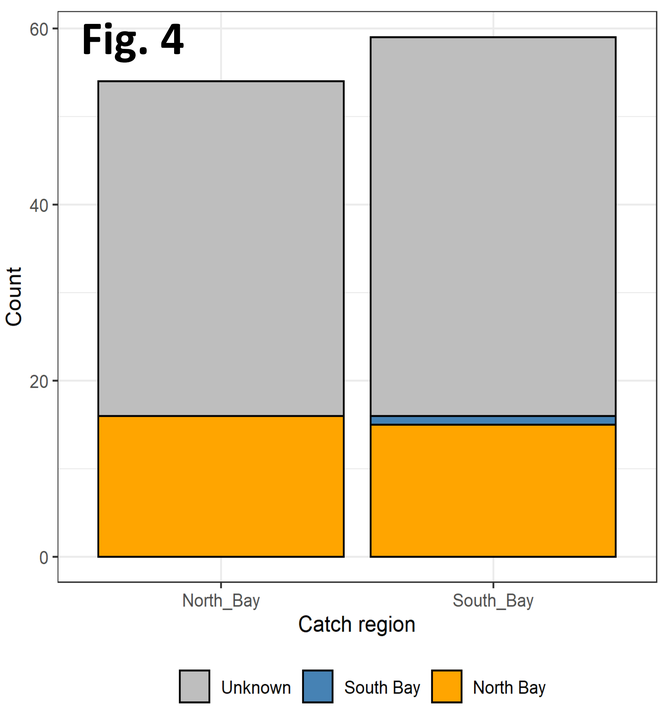


Figure 3: Full salinity profiles calculated from Oxygen isotope analyses in adult Longfin Smelt otoliths.

Figure 4: Multivariate elemental fingerprints of natal zones for 180 larval Longfin Smelt were compared among regions of the SFE to assess geographic discrimination of Longfin Smelt rearing areas.





Using otolith geochemistry to quantify life-history diversity in Longfin Smelt

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Introduction

Little is known about the ontogenetic niche of threatened Longfin Smelt within the San Francisco Estuary, limiting our ability to make informed conservation and water management decisions. We are using increment and geochemical analyses of otoliths (ear bones) to quantify variation in life-history strategies of Longfin Smelt across bay regions, years, and climate regimes.

Methods

- Otoliths are removed and polished to expose daily rings.
- Rings are imaged at 400x on an Olympus 1X71 microscope.
- Age and radius at each increment quantified using ImageJ.
- Growth history retraced using increment profiles.
- Sr isotopes & Trace element chemistry analyzed on LA-ICP-MS.
- Oxygen isotopes analyzed on sensitive high-resolution ion microprobe (SHRIMP).

Results/Discussion

Otolith biogeochemistry (strontium isotopes, oxygen isotopes, and trace elemental fingerprinting) is revealing diverse migratory behaviors in larval and adult Longfin Smelt.

- Sr isotopes reveal larval Longfin Smelt successfully reared at a variety of salinities, with most moving to > 6 psu by 150 days-post-hatch.
- Sr is useful only in low salinity habitats, since Sr concentrations in seawater quickly saturate the mixing curve above ~ 6 psu.
- Oxygen isotopes show Longfin exhibit rapid seaward migration and variable adult life histories.
- Trace elements indicate that we can assess the relative contributions of fish reared in northern vs. southern regions of the SFE.

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