

# Utility of Parentage Based Tagging for Research, Monitoring, and Evaluation of Hatchery Programs within the Columbia River Basin

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## Introduction

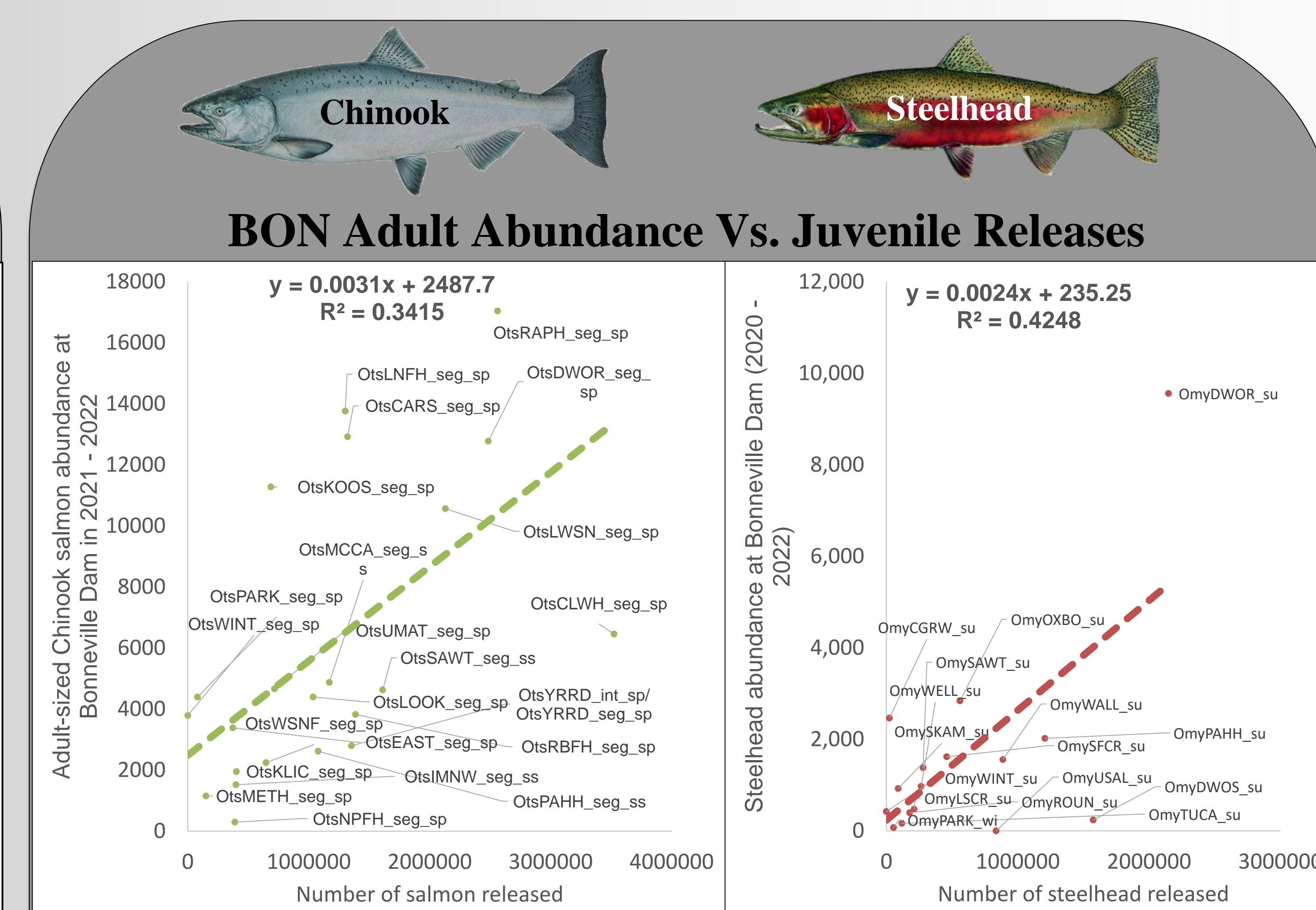
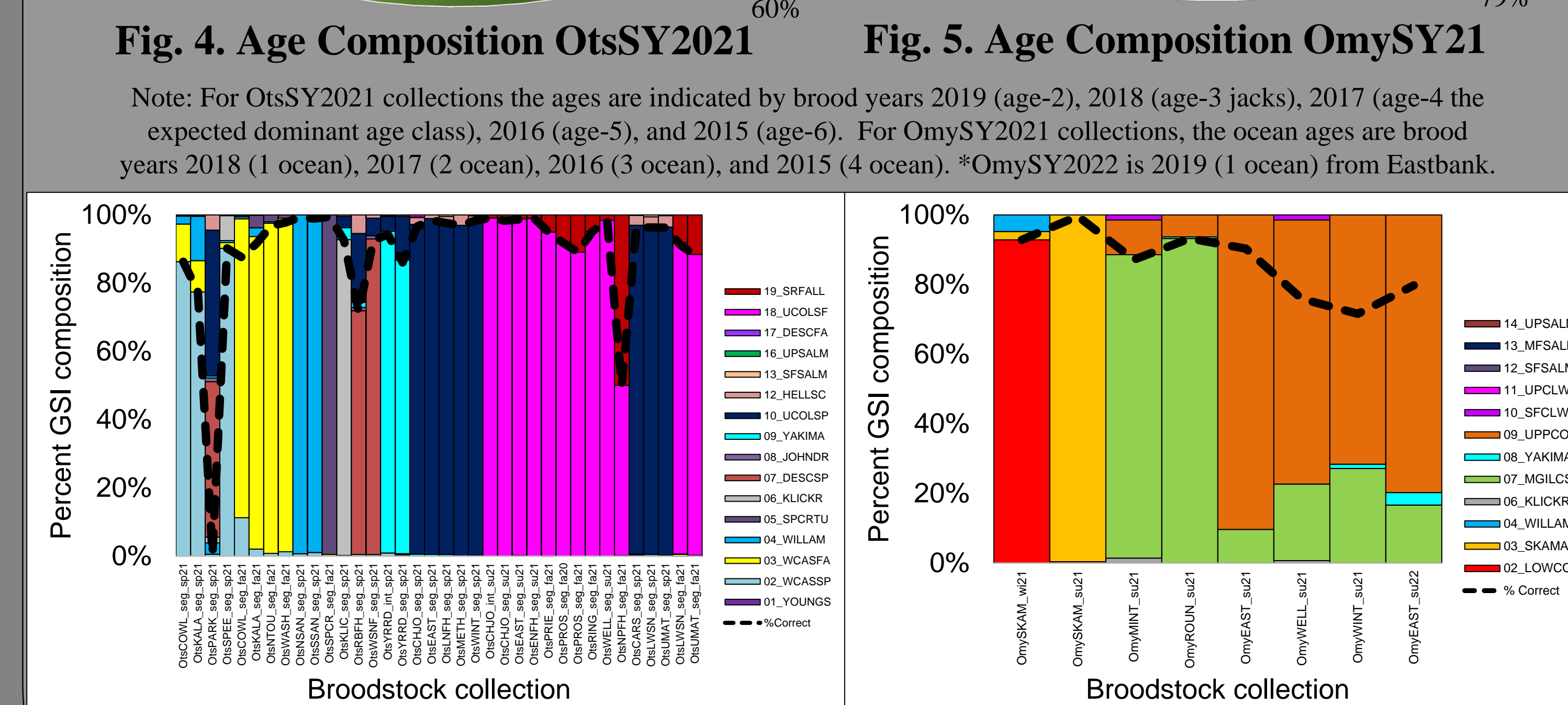
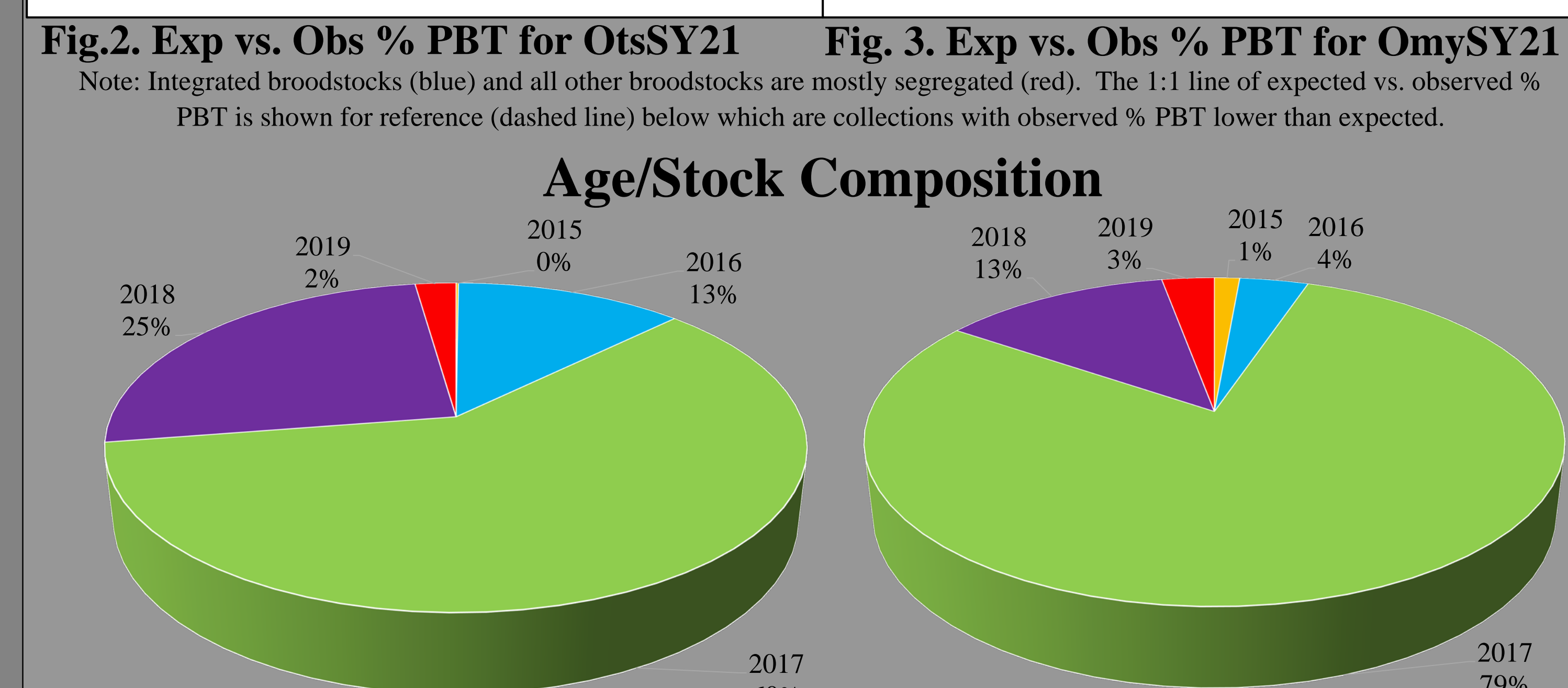
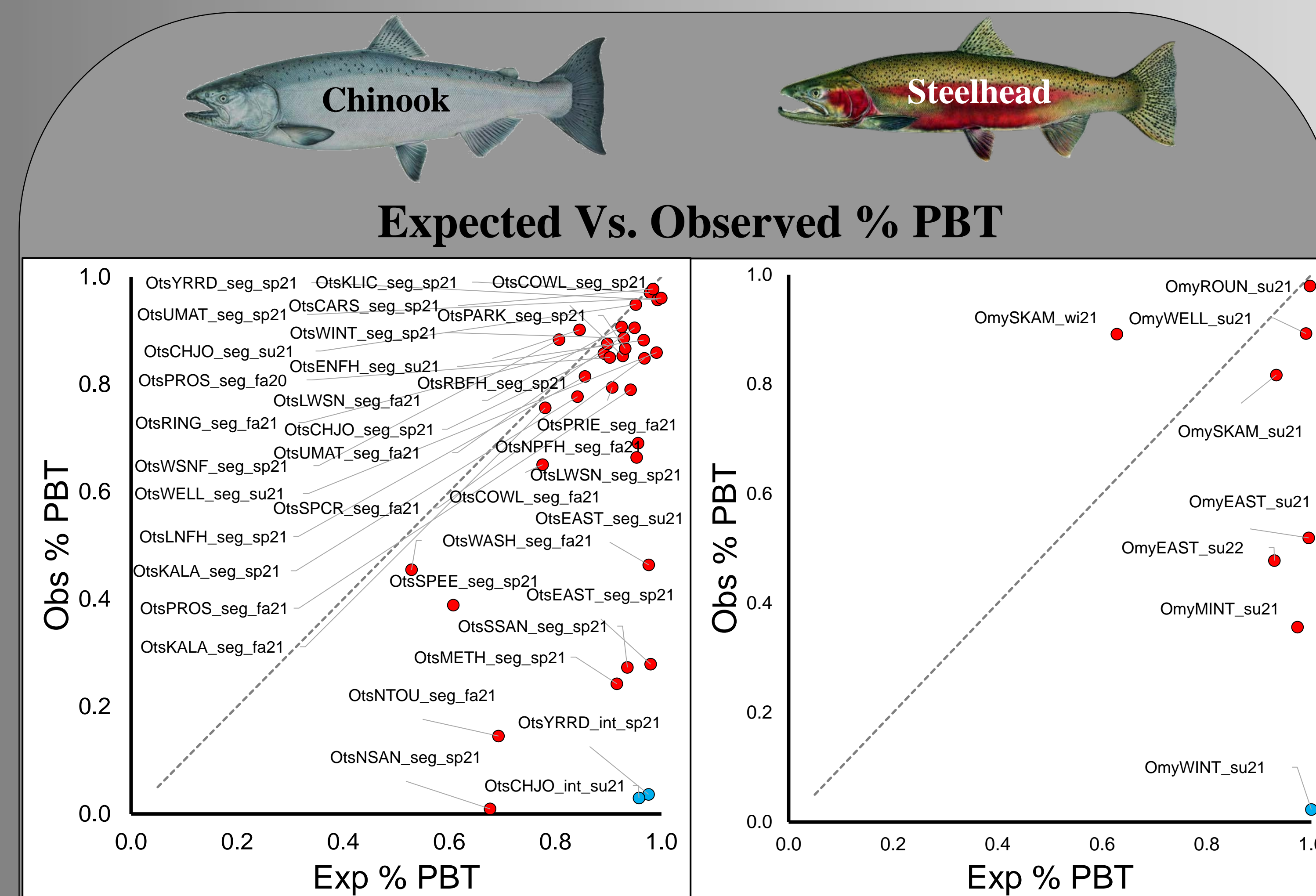
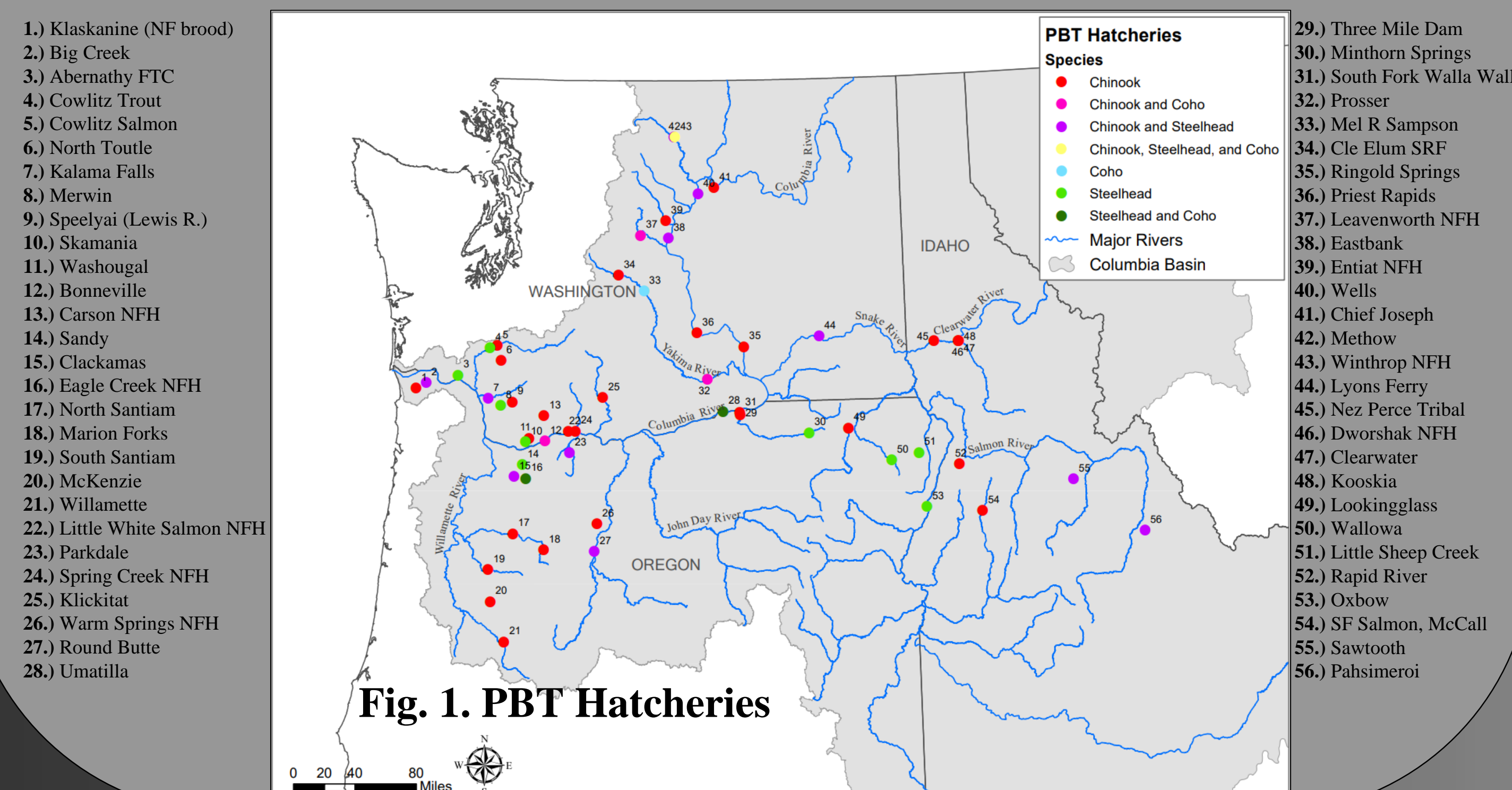
- Salmon and steelhead hatchery programs in the Columbia River Basin (CRB) play a critical role in supporting healthy population abundances and mitigating the effects of hydrosystems.
- Parentage-based Tagging (PBT) is a modern genetic tool that has several advantages over conventional tagging methods (e.g., coded wire tags, physical marks, and Passive Integrated Transponders).
  - Nearly 100% Tag Rates.
  - No Tag Shedding.
  - Non-lethal tag recovery from any life stage.

## Objectives

- Test whether the following stock metrics for SY2021 Chinook Salmon (Ots) and steelhead (Omy) collections had matching observed vs. expected values:
  - Proportion of PBT assignments (% PBT)
  - Age/Stock composition
  - Bonneville Dam adult abundance compared to hatchery juvenile releases

## Methods

- Data via Genotyping-in-Thousands by sequencing (Campbell et al. 2015).
- Identified duplicate genotypes, failed samples (missing > 10% of the genetic markers), and PBT and GSI assignments to calculate tag rates (Horn et al. 2023)
- Genetic Stock Identification (GSI) is used to identify individuals that were not assigned by PBT.
- “Expected % PBT” = weighted average tag rate of all broodstocks that assigned to each spawn year (SY). “Observed % PBT” = proportion of collection assigned by PBT.
- Number of observed GSI assignments of SY21 collections that matched expected stock group = “% correct” GSI stock.
- Juvenile releases from each hatchery (Fish Passage Center) were regressed against estimates of adult abundance at Bonneville Dam (BON).



## Results/Discussion

- Expected % PBT of 36 Chinook Salmon collections (N=44,584) averaged 89.2% (52.8% – 100%, Fig. 2). Expected % PBT of 8 Steelhead collections (N=1,308) averaged 93.1% (62.8% - 100%, Fig. 3).
- Reasons for relatively low observed % PBT include the use of natural-origin fish for broodstock (e.g., integrated broodstock OtsCHJO\_int\_su21 and OtsCHJO\_seg\_su21, Fig. 1 map site #41 / OmyWINT\_su21, map site #43); or a missing SY2017 parent collection (e.g. OtsNSAN\_seg\_sp21, map site #17).
- Ages of the SY2021 collections were comprised mostly of 4-year-olds as expected for Chinook (Fig. 4) and mostly 2-ocean age for Steelhead (Fig. 5).
- The % correct GSI was high for both Chinook (avg. 89.8%, range 0.6% - 99.5%, Fig. 6) and steelhead (avg. 86.3% (range 71.6% - 99.6%, Fig. 7).
- Reasons for low % correct GSI include reintroduced out-of-basin stock (e.g., OtsPARK\_seg\_sp21, map site #23, expected GSI was 02\_WCASSP but obs. GSI 07\_DESCSP + 10\_UCOLSP which were reintroduced).
- The linear regressions showed that effectively for every 322 juvenile spring Chinook release = 1 adult size return @ BON (Fig. 8). For every 417 juvenile steelhead released = 1 adult return @ BON (Fig. 9). Moderate fits of these regressions suggest generally greater numbers of juveniles released results in more adult returns.

## References

- Campbell et al. 2015
- Horn et al. 2023
- Fish Passage Center