FRSCS Lower Fraser River White Sturgeon Monitoring and Assessment Program – *Program Summary 2018*

FRASER RIVER STURGEON CONSERVATION SOCIETY

Since April 2000, the FRSCS Lower Fraser River White Sturgeon Monitoring and Assessment Program has relied on trained volunteers to collect and transfer sturgeon sampling data. Each year, FRSCS volunteers sample several thousand live sturgeon for the presence of uniquely numbered "PIT" tags. Sturgeon samples used for abundance and other analytical purposes are taken from a "core assessment area" that includes over 200 linear kilometers in the lower Fraser River watershed downstream of Lady Franklin Rock (near Yale).

Key Points and Findings – 2018 Program

- The program uses two separate models to generate abundance estimates: an Integrated Spatial and Age-structured Mark-Recapture (ISAMR) model and a Bayesian mark-recapture (BMR24) model.
- Both the ISAMR and BMR24 models indicate that the abundance of 60-279 cm FL White Sturgeon in the lower Fraser River has been in a continual state of decline since 2004.
- Both models agree that in the past 15 years (2003-2018) significant declines in abundance have occurred for 60-99 cm FL juvenile White Sturgeon (ISAMR: 76% decline; BMR24: 78% decline).
- If recruitment rates stay at current levels, abundances of 60-279 cm FL White Sturgeon will continue to decline by ~1.2% per year from 2018 onward.
- There has been a 40% decrease in the average annual growth rate for the population over the last 16 years.
- There is hope for the future of wild Fraser River White Sturgeon. The abundance of mature adult fish should be sufficient to increase recruitment rates over the next decade. However, this can only be achieved if specific actions are taken to reduce impacts and improve environmental conditions.

Sampling Effort and Mark Rates

The proportion of sampled fish that possessed a tag at the time of capture in 2018 was 76.7%. The adult (160-279 cm FL) group has the highest mark rate (89% are tagged), followed by the sub-adult (100-159 cm FL) group (80% are tagged; Figure 1).

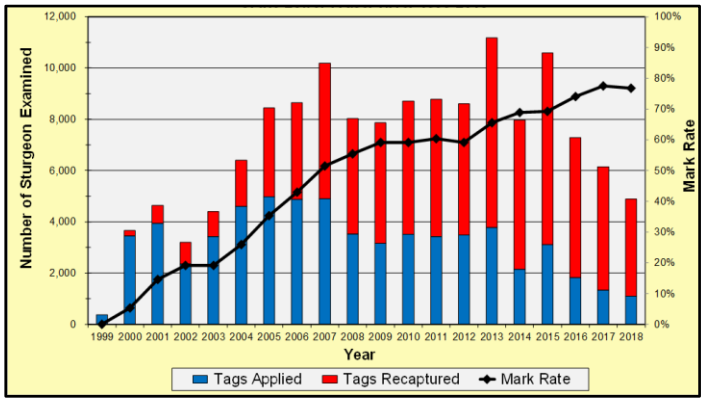

Figure 1. Annual numbers of tags applied, the reported number of tag recaptures, and the annual mark rates (proportion of sampled fish that possessed a tag at the time of capture) for 60-279 cm FL White Sturgeon, 2000-2018. From Nelson et al. (2019).

Abundance Modelling

The program uses two separate models to generate abundance estimates: 1) an Integrated Spatial and Age-structured Mark-Recapture (ISAMR) model (see Challenger et al. 2019); and 2) a Bayesian mark-recapture model (BMR24; see Nelson et al. 2019). The ISAMR model considers all current and historical captures in a single analysis, while the BMR24 model uses a 24-month rolling data window (run separately over 24-month sets). Nelson et al. (2019) determined that the BMR24 model was more sensitive to recent changes in the distribution of tagging and sampling effort than the ISAMR model and concluded that *the best estimates of abundance for 60-279 cm FL Lower Fraser White Sturgeon are currently those derived using the ISAMR model*. Detailed methods and results are in the respective reports, which are available at: https://www.fraserstrgeon.com/research-for-survival-reports/.

Abundance Estimates, Trends, and Forecasts

The 2018 ISAMR abundance estimate for 60-279 cm FL (age 7-55) Lower Fraser White Sturgeon was 44,430 (95% CIs ± 4.5% of the estimate), which is 24.7% lower than the program's highest annual ISAMR abundance estimate in 2004 and 3.6% lower than the previous (2017) ISAMR estimate (Figure 2). Both models agree that in the past 15 years (2003-2018) significant declines in abundance have occurred for 60-99 cm FL juvenile White Sturgeon (ISAMR: 76% decline; BMR24: 78% decline); it is these recent declines in juvenile abundance that have driven the overall declines in total population abundance.

The ISAMR model, which provides abundance forecasts based on recruitment rates and standing age structure, predicts that at current recruitment rates, the downward trend in abundance for 60-279 cm FL White Sturgeon will continue at an average annual rate of 1.2% per year from 2018 onward (Figure 3).

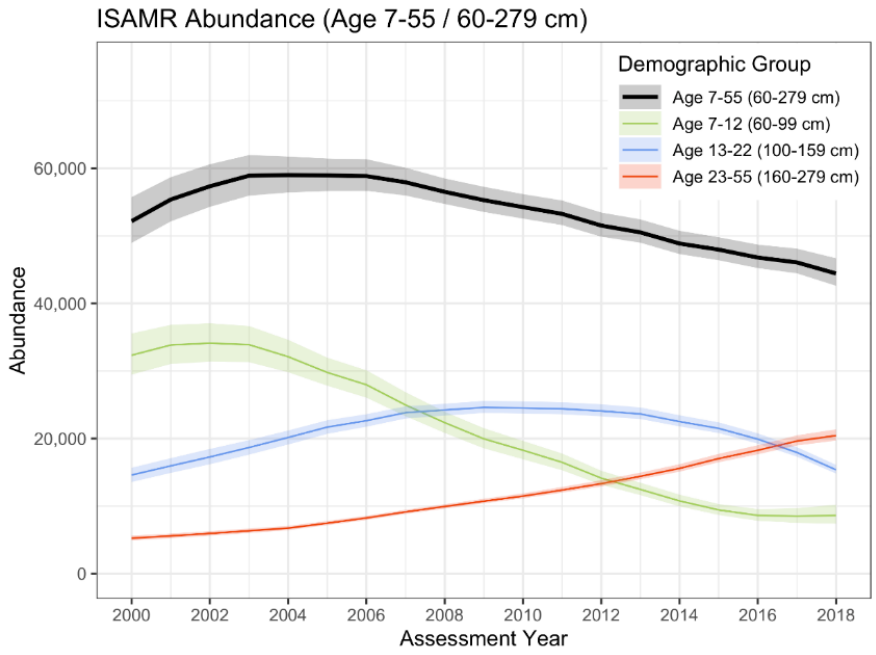

Figure 2. Abundance estimates of age 7-55 (60-279 cm FL) Lower Fraser River White Sturgeon from 2000 to 2018. Shading indicates 95% credible intervals. From Challenger et al. (2019).

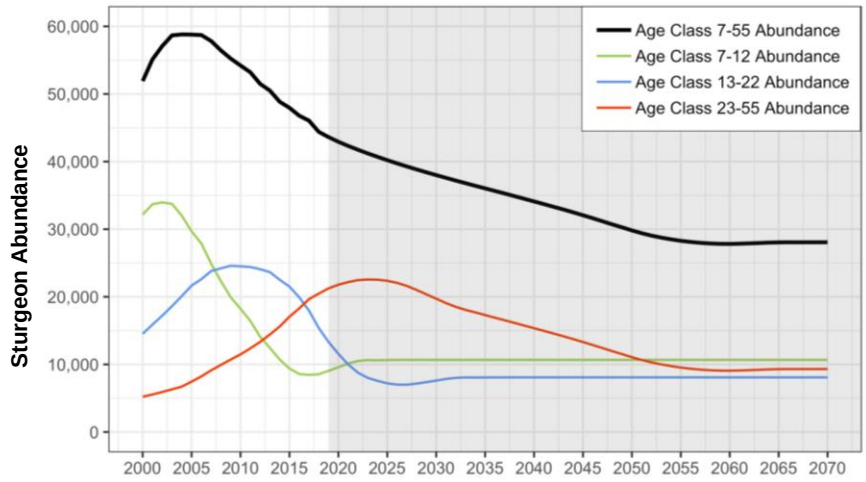

Figure 3. Abundance projections for Lower Fraser River White Sturgeon for 2018-2070 assuming that annual age-1 recruitment remains the same as recent estimates (i.e., 2012-2017 recruitment). Grey shading indicates projected years. From Challenger et al. (2019).

Aside from abundance model results, there are other concerning demographic indicators

- The proportion of juvenile White Sturgeon less than 100 cm FL in total annual measured samples captured by the Albion Test Fishery decreased by 60% between 2000 and 2018.
- The average annual growth rate for all size groups of White Sturgeon in 2018 (3.5 cm/year) was 40% lower than the average annual growth rate in 2002 (5.7 cm/year).
- The number of reported and confirmed sturgeon mortalities in the lower Fraser River in 2018 (46) was the highest observed in the program; the majority of these mortalities were mature adult fish over 160 cm FL.

There is hope for the future of wild Fraser River White Sturgeon

Juvenile recruitment rates are currently below the level of population sustainability, but there is hope! The current and forecast abundance of mature adult fish in the population should be sufficient to increase recruitment rates over the next decade as long as specific actions are taken to reduce impacts and improve environmental conditions. The authors recommend immediate actions to improve age-1 recruitment and survival rates for age 1-6 sturgeon. These measures should include: protection of overwintering, spawning, and juvenile rearing habitat; the removal of all fishing activity (and restrictions of boating activity) from known sturgeon spawning areas during the spawning period; a reduction of the incidence of net interceptions from all net fisheries during all times of the year; a reduction in the annual capture rates in the recreational fishery; and the identification and protection of spawning and rearing areas for the prey species upon which juvenile and adult sturgeon depend (e.g., salmon and eulachon).