DATA TO SUPPORT RIVER STURGEON CLOSURE

The impact of stress from fishing was discussed in detail in Meeting #9 of the WSCWG on November 11, 2023, and is mentioned in the meeting slides and notes that were sent out.

We also discussed this, with citations, in the presentation and Supplemental Material document submitted to the FGC for the October 11 emergency regulation meeting https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=216457&inline

(Slides 23-24 of the presentation and supplemental documents starting on page 57 in the pdf).

The Supplemental Materials document was also referenced in the 11/11/23 meeting and slides when this question came up.

This is not a comprehensive literature review of this topic, which is substantial, but from those references:

- Schreck (2010) is a superb review paper about fish stress and reproduction from a well-respected researcher and provides a good place to start understanding this subject.
- Webb and Doroshov (2011) provide an excellent discussion of the role of hormones (including stress hormones) in sturgeon in particular and provides direct evidence of physiological stress correlated with play time observed in wild White Sturgeon in a regulated C&R fishery.
- McLean et al. (2016) provides more direct evidence of the physiological stress response resulting from handling in White Sturgeon.
- Schaffter (1997) provides evidence that in Sacramento River White Sturgeon that were caught on setlines and handled more gently than as occurs in sport angling, 65% aborted their upstream migration and did not spawn.
- Conte et al. (1998) is the is the basis for the CA sturgeon aquaculture industry. It documents that 30-40% of wild fish brought into the hatchery resorbed their eggs and did not spawn. This is notable because the entire goal of that very expensive project was to get fish to spawn, so the fish were handled by experts taking every precaution to achieve that goal.

Additional sources of information include department telemetry data of fish handled in tagging and rescue operations, which document that 79% of those fish do not continue their migration that year. A careful reading of the references above, including a reading of the references those various authors use makes clear that it is widely understood by fish physiologists that stress has negative impacts on fish reproductive behavior and physiology. Review of those sources along with our own tagging information and

documentation show that White Sturgeon display the same physiological stress response as is seen in other sturgeon and other bony fishes.

We recognize that restricting fishing, even C&R, in these areas impacts opportunity and we also recognize that in general angling opportunity is shrinking, and that is being realized in Central Valley anadromous fisheries more so than in other places. It's certainly not something we take lightly or take any pleasure in doing. We are trying strike a balance between recreational opportunity and conservation of a species that, despite what some may say about our data, is clearly declining at an alarming rate just like most other native fish in this system. The most important thing we can do on the fishing regulations side to try to maintain and rebuild White Sturgeon populations is protect them during the most critical period in their lives, maximize spawning success and keep adding new generations to the population.

Select citations

Conte, F., S. I. Doroshov, and P. Lutes. 1988. Hatchery manual for the white sturgeon (*Acipenser transmontanus* Richardson): with application to other North American Acipenseridae.

McLean, M. F., K. C. Hanson, S. J. Cooke, S. G. Hinch, D. A. Patterson, T. L. Nettles, M. K. Litvak, and G. T. Crossin. 2016. Physiological stress response, reflex impairment and delayed mortality of white sturgeon *Acipenser transmontanus* exposed to simulated fisheries stressors. Conservation Physiology 4(1):1–14.

Schaffter, R. G. 1997. White sturgeon spawning migrations and location of spawning habitat in the Sacramento River, California. California Fish and Game 83(1):1–20.

Schreck, C. B. 2010. Stress and fish reproduction: The roles of allostasis and hormesis. General and Comparative Endocrinology 165(3):549–556.

Webb, M. A. H., and S. I. Doroshov. 2011. Importance of environmental endocrinology in fisheries management and aquaculture of sturgeons. General and Comparative Endocrinology 170(2):313–321.