Health evaluation of experimental Delta smelt released into California waters

JS Foott USFWS CA-NV Fish Health Center (**FHC**) 4/5/2021

Proposed actions: Delta Smelt pathogen infection status will be obtained from mortalities associated with marking operations prior to the initial release, as well as an understanding of rearing mortality causation 45 days prior to movement. No large scale, single time point lethal inspection will be conducted on captive Delta smelt based on their listed status, genetic importance, and historic absence of viral or listed bacterial pathogens. A single report on health status will be communicated with cooperators on an annual basis.

Objectives of health monitoring- Primary function of inspection program is to preclude the movement of fish with *significant* pathogens that would negatively affect fish at another facility or watershed. Significant pathogen defined as:

1. Virulent with limited or no treatment available, or
2. Exotic to watershed, and
3. As defined in the draft 713FW1-2 Aquatic Animal Health policy "A pathogen that, if detected, would be likely to adversely impact FWS aquatic animal programs by producing high mortality or by triggering movement restrictions, or that would change the status of a recognized disease zone or compartment in a manner that would restrict movements by other entities including commercial aquaculture."

Movement of fish halted if:

1) Unexplained mortality event (> 2.0 % of rearing unit over 3 day period) within 45 days of transfer, or
2) Viral agent or "significant pathogen" is isolated from the population.

Concurrence of this approach with CDFW: Dr. Mark Adkison (Statewide Fish Health Coordinator) has agreed with this proposal.

Procedure:

During the 45 day period prior to the first release of the season, Fish Conservation and Culture Laboratory (**FCCL**) will immediately contact the FHC if a 3 day cumulative mortality of >2.0 % occurs within a rearing unit population of smelt destined for release. This action will trigger a diagnostic response by the FHC to determine the cause(s) of the mortality. Moment suspended if a "significant" pathogen(s) detected or chronic mortality continues without a diagnosis of cause. This information will be forwarded to a pre-determined group.

Surveillance (historical data) will be conducted on fresh mortalities that occur during marking process prior to initial release. Chilled carcasses expressed-shipped to the FHC for testing. A minimum of 20 and maximum of 60 fish sampled over a 1-week period. Laboratory assays (viral and bacterial) will likely not be completed prior to transfer.

Note: The detection of *Mycobacterium* sp. will not be considered a significant pathogen for this species. This bacterial clade is isolated from both wild and domesticated smelt.

Basis for low health risk designation:

Virus in smelt species or other SF bay/ Sacramento estuary fish

Baxa DV, A. Javidmehr, SM Mapes, and SJ The. 2015. Subclinical Mycobacterium infections in wild delta smelt. Austin J. Vet Sci & Animal Husb. 2(1):1004

Note: No viral isolation from 741 sub adult and adults assayed on five cell lines, *Mycobacterium* sp. DNA detected by PCR in 96% of samples however, the bacterium was not isolated in culture.

Foott JS and J Bigelow. 2010. Pathogen survey, gill Na-K-ATPase, and leukocyte profile of adult delta smelt. California Fish and Game 96:223-231.

Note- nematode and trematode infections observed in viscera of < 10% of histological specimens. No viral agents detected. Mycobacterium detected by PCR only.

Teh SJ. 2007. Final report of histopathological evaluation of starvation and/or toxic effects on pelagic fishes: Pilot study of the health status of 2005 adult delta smelt in the upper San Francisco estuary. CA Depart. Fish. Game.

Note: 385 fish examined with no "significant evidence of disease or parasitic infestations." 1.3% of samples with internal helminth parasites.

The CA-NV FHC has assayed 1501 delta smelt for viral and bacterial pathogens beginning in 2005. No viral CPE observed in 1160 fish kidney samples inoculated onto EPC, CHSE214, BF-2, and SSN-1 cell lines since 2005 (Ca-NV Fish Health Center records). Only 79 wild fish were tested on BF-2, and SSN-1 cell lines in 2010 and 2011. No viral agents detected in FCCL samples submitted to UC Davis Veterinary laboratory (Dr. Esteban Soto, June 3, 2020 pers. comm.). Neither *Aeromonas salmonicida* nor *Yersinia ruckeri* have been isolated in over 800 samples (%BHIA Positive table 1). Several *Mycobacteria* sp. have been detected in both asymptomatic and diseased smelt by culture, acid-fast staining (%AFS positive table 1), PCR (%Myxo PCR positive, Table 1).

Table 1. Summary of CA-NV FHC pathogen records for inspection and diagnostic cases from Byron (FCCL) and Livingston Stone NFH (LS NFH) as well as wild smelt tested under the National Wild fish Survey or contracted special studies. Percent positive for BHIA = salmonid pathogens *Aeromonas salmonicida* or *Yersinia ruckeri*, AFS = acid fast bacteria (i.e. mycobacteria), Myco PCR = molecular assay for mycobacteria.

Case Type	Total Number of Cases	Number of Fish Sampled	% Viral Positive	% BHIA Positive	% AFS Positive	% Myco PCR Positive
Byron Diagnostic	2	26	nd	nd	nd	nd
Byron Inspection	16	1006	0%	0%	0%	89%
LSNFH Diagnostic	7	99	0%	0%	35%	82%
LSNFH Monitoring	15	273	0%	0%	17%	83%
Special Study - NWFS	3	97	0%	0%	0%	32%
Grand Total	**43**	**1501**	**0%**	**0%**	**3%**	**84%**