Table 3 - Summary of Occupancy Studies

Category		Mahardja et al (2017)	Simonis & Merz (2019)	Petersen & Barajas (2018)			Bever et al. (2016)	Latour (2016)	Hendrix et al. (2022)	Polansky et al. (2018)	Duarte & Petersen (2021)		Hamilton & Murphy (2020)	Mahardja et al (2017)	Petersen & Barajas (2018)			Hendrix et al. (2022)	Duarte & Petersen (2021)	
	Analytical Approach	Regression	Bayesian	State Space			UnTRIM, correlation	GLM	Bayesian	State Space GAM	State Space		Affinity Analysis	Regression	State Space			Bayesian	State Space	
	Dependent Variable	Population adjusted abundance	Density	Probability of Occupancy			Station Rank	CPUE	Probability of Occupancy	Density	Probability of Occupancy	Probability of Occupancy	Catch relative to effort	Probability of detection	Probability of detection			Probability of detection	Probability of detection	
	Survey(s) Analyzed	20mm	20mm	20mm	STN	Bay Study	FMWT	FMWT	FMWT	SKT	EDSM	SKT	SKT, 20mm, STN, FMWT	20mm	20mm	STN	Bay Study	FMWT	EDSM	SKT
	Period	Apr-Jul	Apr-Jul	Apr-Dec	Jun-Aug	Jan-Dec	Sep-Dec	Sep-Dec	Sep-Dec	Jan-May	Jun-Mar	Jan-May	Jan-Dec	Apr-Jul	Apr-Dec	Jun-Aug	Jan-Dec	Sep-Dec	Jun-Mar	Jan-May
	Factor																			
Abiotic	Salinity/EC	**O**	**O**	**O**	**O**	**O**	**O**	x	**O**	**O**	**O**	**O**	**O**							
	Temperature	**O**		x	**O**	x	x	x	**O**	x (a priori considered and discarded)	**O**		**O**							
	Turbidity/Secchi	**O**	**O**	d	d	d	**O**	**O**	x	**O**			**O**		**D**	**D**	**D**	**D**	**D**	**D**
	Prey		**O**					x					**O**							
	Flow or X2		**O**	**O**	**O**	**O**		x	x		x									
	Velocity		**O**				**O**		x											
	Dissolved Oxygen										x									
Sampling	Tide Stage	x		d	d	d	x			**O**				**D**	x	x	**D**	**D**		**D**
	Sampling Duration/Volume			d	d	d	x								**D**	**D**	x	**D**	**D**	
Physical																				
	Region (Categorical)			**O**	**O**	**O**		**O**	x	O (space as continuous, not categorical)	**O**	**O**								**D**
	Depth			d	d	d	x								x	**D**	**D**	x		
	Bathymetry						x													
	Water Body Type												**O**							
	Distance to Wetlands								x											
	Distance to shore										x									
Fish	Prior Distribution		n	n	n	n														
	Length/Size			d	d	d								**D**	**D**	x	x	**D**		
	Competitors								x											
	Predation Pressure								x											
	Prior Abundance																	x		
Timing	Year (categorical)	O		**O**	x	x		**O**												**D**
	Month							**O**		**O**									**D**	
	Day of year	O		**O**	**O**	x			x	**O**	**O**	**O**		**D**						
	Time of day			d	d	d	x								**D**	**D**	x		**D**	**D**
Source:		Table 3	Fig 4, p.19		Tables 6,7		Table 3	Table 1	p.8/17	Table 1	Table 2	Table 2	Table 6	Table 3		Tables 3,4		p.8/17	Table 2	Table 2

Legend

O	included in best occupancy model
d	included as a factor in the detection model
x	considered but not included in the best model
blank	not considered in the analysis
n	spatio-temporal autocorrelation noted

Bever, A. J., MacWilliams, M. L., Herbold, B., Brown, L. R., and Feyrer, F. (2016). Linking hydrodynamic complexity to delta smelt (Hypomesus transpacificus) distribution in the San Francisco Estuary, USA. San Franc. Estuary Watershed Sci. 14, 1–27. doi: 10.15447/sfews.2016v14iss1art3

Duarte, A., & Peterson, J. T. (2021). Space-for-time is not necessarily a substitution when monitoring the distribution of pelagic fishes in the San Francisco Bay-Delta. Ecology and Evolution, 11(23), 16727-16744.

Hamilton, S. A., and Murphy, D. D. (2020). Use of affinity analysis to guide habitat restoration and enhancement for the imperiled delta smelt (Hypomesus transpacificus). Endanger. Species Res. 43, 103–120. doi: 10.3354/esr01057

Hendrix, A.N., Fleishman, E. Zilli, M.W, and Jennings, E.D. (2022) Relations Between Abiotic and Biotic Environmental Variables and Occupancy of Delta Smelt (Hypomesus transpacificus) in Autumn. Estuaries and Coasts. https://doi.org/10.1007/s12237-022-01100-x

LaTour, R. J. (2016). Explaining patterns of pelagic fish abundance in theSacramento-San Joaquin Delta. Estuaries and Coasts 39, 233–247. doi: 10.1007/s12237-015-9968-9

Mahardja, B., Young, M.J., Schreier, B. and Sommer, T. (2017) Understanding imperfect detection in a San Francisco Estuary long-term larval and juvenile fish monitoring programme. Fish Manag Ecol. 2017;24:488–503

Peterson, J. T., and Barajas, M. F. (2018). An evaluation of three fish surveys in the San Francisco Estuary, California, 1995-2015. San Franc. Estuary Watershed Sci. 16, 1–28. doi: 10.15447/sfews.2018v16iss4art2

Polansky, L., Newman, K. B., Nobriga, M. L., and Mitchell, L. (2018). Spatiotemporal models of an estuarine fish species to identify patterns and factors impacting their distribution and abundance. Estuar. Coasts 41, 572–581. doi: 10.1007/s12237-017-0277-3

Simonis, J. L., and Merz, J. E. (2019). Prey availability, environmental constraints, and aggregation dictate population distribution of an imperiled fish. Ecosphere 10:e02634. doi: 10.1002/ecs2.2634

Correspondence

11/1/2022 Request sent to corresponfing authors to review
11/2/2022 Jim Petersen did not request changes
11/2/2022 Leo Polansky sugegsted changes. These were incorporated 11/8/22.
11/7/2022 Aaron Bever did not request changes
11/7/2022 Shawn Acuna suggested considering:

Tobias, V. (2021) Simulated fishing to untangle catchability and availability in fish abundance monitoring, San Francisco Estuary and Watershed Science, 19(3).
Duarte, A., & Peterson, J. T. (2021). Space-for-time is not necessarily a substitution when monitoring the distribution of pelagic fishes in the San Francisco Bay-Delta. Ecology and Evolution, 11(23), 16727-16744.
Mitchell, L., & Baxter, R. (2021). Examining Retention-at-Length of Pelagic Fishes Caught in the Fall Midwater Trawl Survey. San Francisco Estuary and Watershed Science, 19(2).
From Tobia p.12:

> "For Delta Smelt, the species simulated here, the simulation shows that the effect of turbidity on catchability is small when availability is held constant. This suggests that water clarity's influence on reaction distance is not likely to be the cause of the relationship between Secchi depth and Delta Smelt catch ref lected in the monitoring data."

Duarte & Petersen was added to the list of studies.
From Mitchel & Baxter p.9:

> "We found that 95% retention of Threadfin Shad, American Shad, and Delta Smelt in the FMWT cod end occurs around 45-, 49-, and 61-mm fork length, respectively".