

scwd² Seawater Desalination Program Screened, Open-Ocean Intake Effects Assessment



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Dr. Dave Mayer



Presentation Outline

- Overview of the study team and objectives
- Summary of the Source Water and Potential Entrainment Study
- Summary of the Pilot Intake Screen Study
- Overall conclusions of the Study

Tenera was the lead for the Intake Effects Assessment Study

- **Agencies:**



- **Survey, Analysis and Reporting: Tenera**

- Principal Investigator, David Mayer
- Operations Manager, Carol Raifsnider
- Biostatistician, John Steinbeck
- Ocean Survey Operations, Kinnetics

Technical Working Group provided independent guidance and review

- Interdisciplinary group of experts, scientists and regulators
- Reviewed and provided comments on the test plan and commented on study results.

Technical Working Group (partial list)

- **Gregor M. Cailliet, Ph.D.** Professor Emeritus of Biology, Moss Landing Marine Laboratories & California State University, Fresno
- **Brad Damitz, MPA** Environmental Policy Specialist, MBNMS
- **George Isaac** Environmental Specialist III, California Department of Fish & Game
- **Tom Luster**, Deputy Director, CA Coastal Commission
- **Alec MacCall, Ph.D.** Senior Scientist in the Fisheries Ecology Division, National Marine Fisheries Service
- **Dave Pereksta** Avian Biologist, USFWS
- **Pete Raimondi, Ph.D** Professor of Ecology and Evolutionary Biology
- **Curt Storlazzi, Ph.D.** Research Geologist & Oceanographer, USGS
- **Peter Von Langen, Ph.D.** RWQCB

General Definitions of Impingement, Entrainment and Entrapment

- **Impingement**: occurs when fish or large organisms become trapped against the screens by water flowing into the intake system.
- **Entrainment** : occurs when smaller organisms pass through screening devices and are drawn into the intake system.
- **Entrapment**: occurs when fish or large organisms pass through an intake opening and cannot freely swim back out of the intake.

Intake Effects Assessment Study Objectives

- Characterize the source water fish and shellfish species of larvae and potential entrainment.
- Evaluate effectiveness of an intake screen to prevent entrapment and impingement and reduce entrainment.
- Assess potential impacts of an open-ocean intake in Mitchell's cove.

Samples collected near the proposed intake are used to estimate entrainment impacts



Scientists painstakingly count and identify the organisms captured in the sample nets

Paired plankton nets are used to collect samples

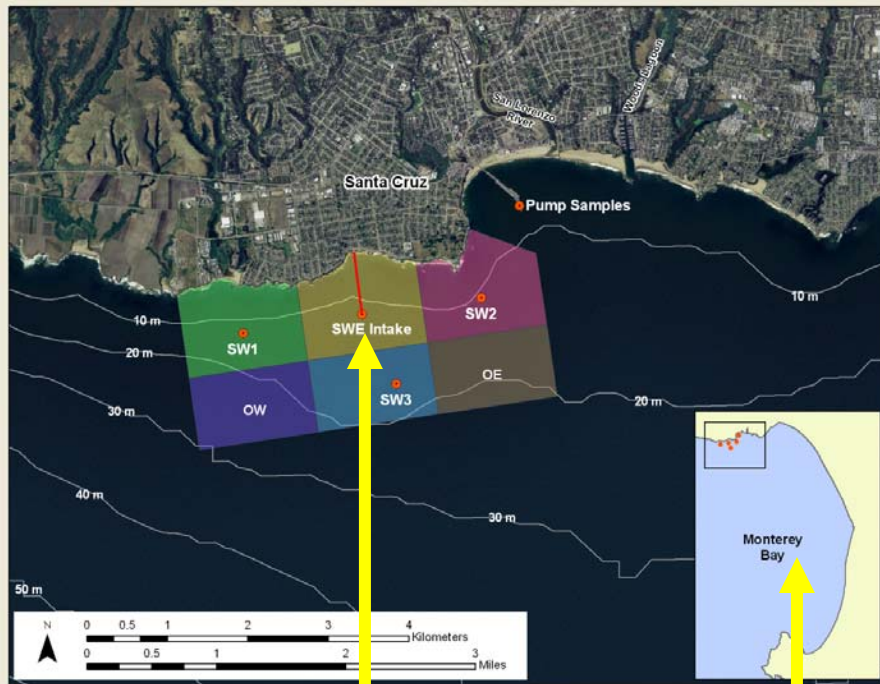
Number of towed entrainment and source water plankton samples

Station	Number of Surveys	Number of Samples per Survey	Basis for Number of Samples per Survey	Total Number of Samples per 13-Month Test Period
SWE	13	4	2 reps x 2 cycles (1 day cycle + 1 night cycle)	52
SW1	13	2	1 rep x 2 cycles (1 day cycle + 1 night cycle)	26
SW2	13	2	1 rep x 2 cycles (1 day cycle + 1 night cycle)	26
SW3	13	2	1 rep x 2 cycles (1 day cycle + 1 night cycle)	26
				130

Larval fish and shellfish found near proposed intake site

- Larval Fish
 - Over 50% of larval fish were white croaker 
 - Another 32% were one of six other taxa: anchovies, sanddabs, gobies, ronquils, smelts and sculpins
- Larval Shellfish
 - Shrimp accounted for approximately half the shellfish larvae
 - Another 38% of total shellfish larvae were Cancer crab larvae

Estimated entrainment impacts: the proportion of # larvae entrained to the # larvae in the source water



Larvae entrained at intake

Larvae in source water

=

Percent entrainment losses
are very small

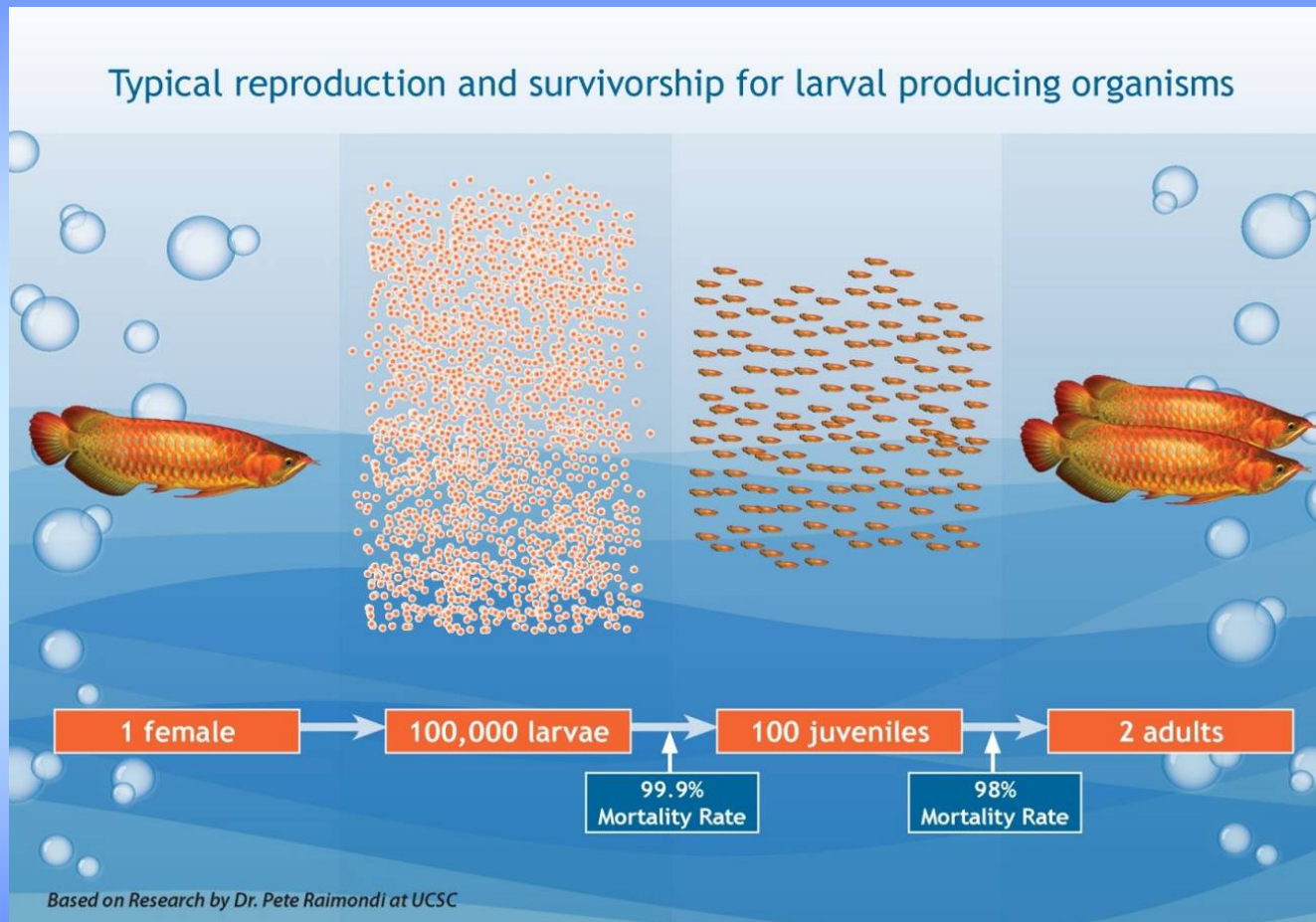
Species	Percent Loss
White croaker	0.016 %
Anchovy	0.014 %
Goby	0.019 %
Sanddab	0.010 %
Sculpin	0.009 %
Rockfish	0.003 %
Halibut	0.008 %

Based on 7 mgd intake flow to produce 2.5 mgd

The Entrainment Study results & findings:

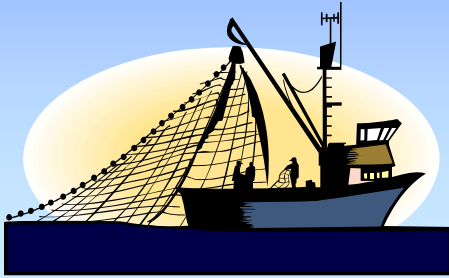
- No threatened or endangered marine organisms were found in the samples in the source water area.
- The average percentage entrainment for the top 80-percent of the fish larvae in the source water area was 0.02-percent.
- The average percentage entrainment for the shrimp and crab larvae in the source water area was 0.007-percent.
- These very low entrainment values do not represent a significant source of mortality for these species.

Understanding the natural survivorship of larval producing organisms



The natural-occurring mortality rate is very high.

The scwd² impact to white croaker and other fish species are minimal relative to other takes.



- Monterey County commercial and recreational fishing:
~ 160,000 white croaker per year



- Open-ocean intake (7 MGD intake volume)
Equivalent of ~50 white croaker per year

A photograph of a wastewater treatment facility. In the foreground, there is a rocky stream bed with various green plants and reeds. In the background, several large, circular, corrugated metal intake screens are visible, mounted on concrete structures. The sky is a clear, bright blue. The text "Intake Screen Pilot Studies" is overlaid in the center in a bold, yellow font.

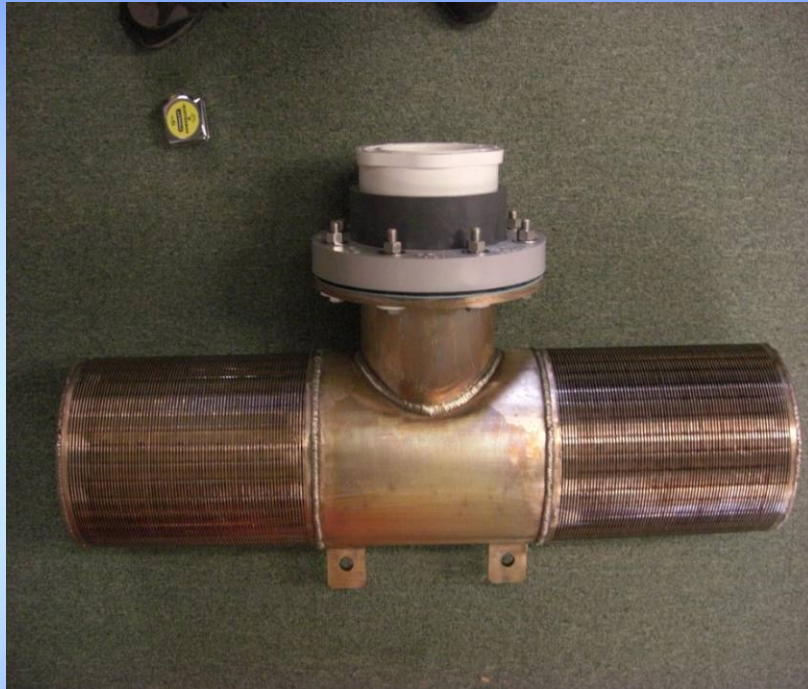
Intake Screen Pilot Studies

USF/Johnson

Passive, narrow-slot intake screen pilot study objectives

- Evaluate ability to prevent impingement
- Evaluate ability to prevent entrainment of organisms larger than 2 mm screen slot size
- Evaluate currents and water motion around the screen
- Evaluate bio-fouling and corrosion

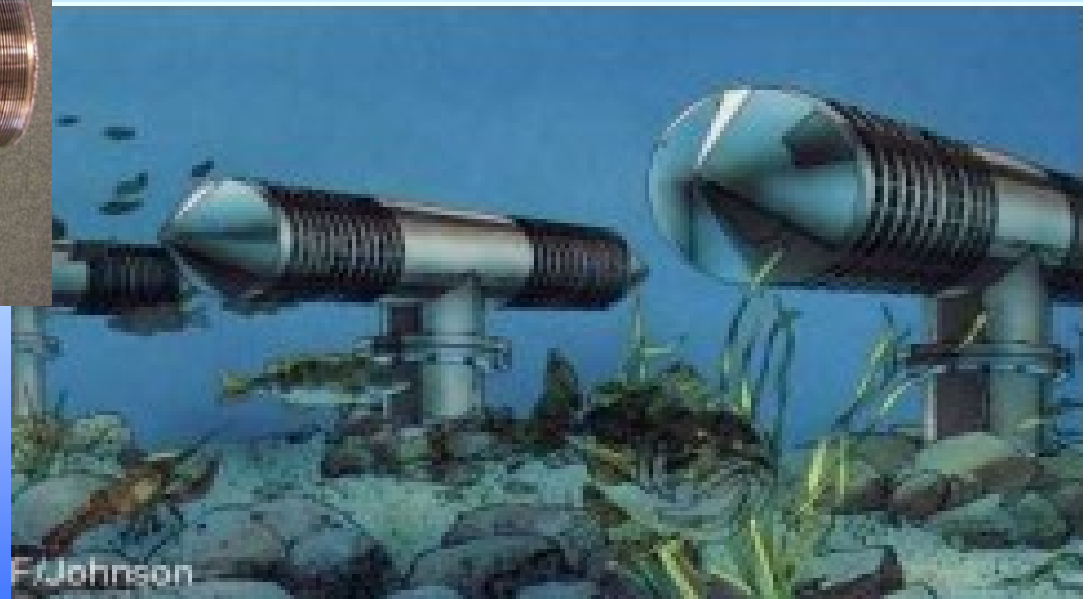
Passive Screened Intake System



Pilot scale intake screen

2 mm screen slot size
(2 mm equals 0.079 inches)

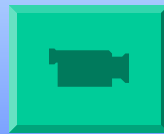
Very low intake velocities
and small screen slot size
helps to minimize impacts



Cylindrical wedgewire screen

Video of the Operating Pilot Intake Screen

- Interaction of larval rockfish with the operating screen
- Dye testing to show currents around an operating screen



The results from pilot testing of the 2 mm passive intake system included:

Screened Intake	Un-screened Intake
<u>Prevented</u> entrainment of adult & juvenile fish species in the area.	Juvenile fish were entrained
<u>Excluded</u> most larval fish and marine organisms larger than 3 mm	All Larval fish were entrained

Because of the large number of entrained organisms smaller than the 2 mm screen openings, there was no statistically significant difference between the screened and unscreened intake entrainment results.

Intake Effects Assessment Study Results & Conclusions

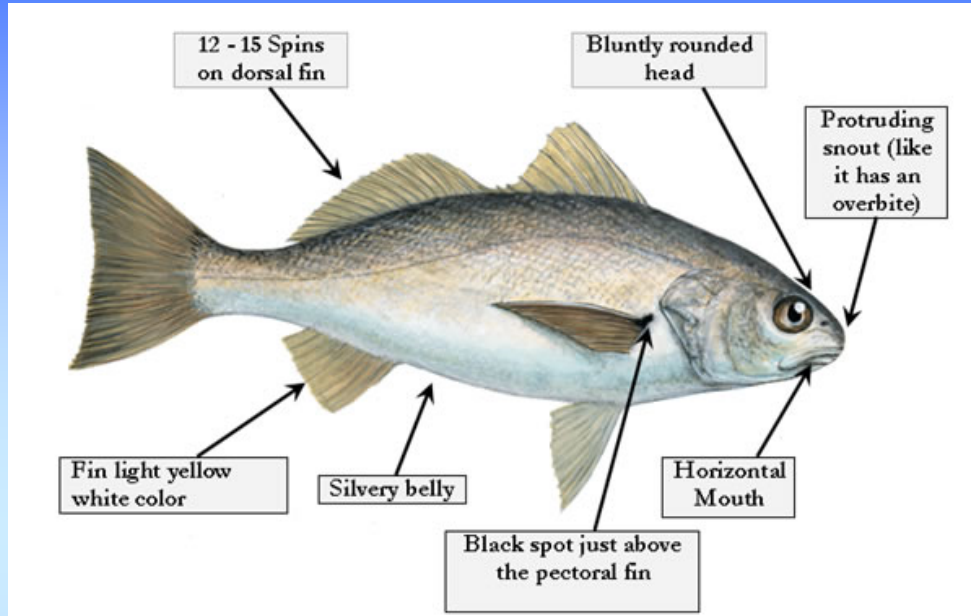
- The minute entrainment* of an unscreened **scwd**² 7 mgd-intake in Mitchell Cove would be too small to affect any source water population of fish or shellfish.
- Using narrow-slot screens with low intake velocity at the ocean end of the intake pipe would:
 - Eliminate impingement and entrapment of fish and other marine organisms, and
 - Reduced entrainment of larval fish and other marine organisms larger than the screens' openings.

* ~2/10,000th of source water larvae

Thank You

**Definition slide of White Croaker-
needs to be at the end**

White Croaker



- Habitat: Sandy mud bottom
- Depth: Most common at 30 ft
- Prey: Benthic organisms
- Reproduction: 18 –24 spawnings per year in batches of ~25,000 eggs for 6 to 10 inch fish or
- ~500,000 eggs/female/year

Recreational Fishery

Year	Estimated Catch (No.)	Estimated Weight (lb)
2005	51,129	15,426
2006	45,856	12,093
2007	33,932	8,416
2008	8,400	1,917
2009	3,511	1,364
Average	28,565	7,843



Map of yellow and red zones for fish caught from Ventura Harbor to San Mateo Point

