PDELT: A Preliminary Look at Fish Anomalies in the Sacramento-San Joaquin Estuary

Interagency Ecological Program

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Parasites, **D**eformities, Fin **E**rosion, **L**esions, **T**umors

Seines

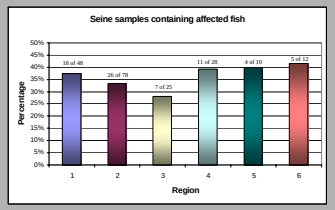


Fig. 1- The highest percentage of samples containing affected fish was seen in Regions 4, 5 & 6 (ranging 39.5-41.5%). Regions 1, 2 & 3 had fewer affected samples with Region 3 showing the least at 28%.

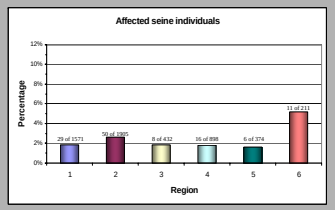


Fig. 2- The highest percentage of affected individuals (5%) was seen is Region 6 (Bay Area). The lowest percentage of affected individuals (1.5%) was Region 5 (San Joaquin River).

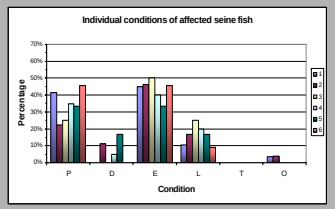


Fig. 3- Of the affected fish, fin erosion (E) is the most commonly seen anomaly overall, followed by parasites (P), lesions (L) and deformities (D). Other anomalies (O), such as hemorrhages and fungi, were seen on less than 4% of affected fish in any region. No tumors (T) were seen during the initial evaluation period.

I. INTRODUCTION

In a continuing effort to provide data on the relative abundance and health of fish populations in the Sacramento-San Joaquin Estuary, the U.S. Fish & Wildlife Service, Stockton, California, Delta Juvenile Fish Monitoring Program (DJFMP) has begun examining external anomalies of individual fish using a Rapid Bioassessment Protocol (RBP). The "PDELT" method allows for a minimally invasive evaluation of gross fish health that can be performed concurrently with existing sampling activities. PDELT outlines five basic health conditions that are evaluated in a presence/absence method; Parasites, Deformities, Fin Erosion, Lesions and Tumors. Here we present initial results from the implemented RBP at three trawl stations and six seine regions throughout the Sacramento-San Joaquin Estuary for the period of November 14 through December 27, 2005.

Yellowfin Goby showing fin erosion, parasite and lesion.
Caught at Chipps Island trawl station.

II. METHODS

Fish were examined for anomalies during regular trawl and seine sampling actions performed according to DJFMP standard operating procedures (USFWS, 2005). Individuals were inspected for parasites, deformities, fin erosion, lesions, and tumors. An additional category (other) was added to cover other anomalies occasionally seen during sampling (such as hemorrhages and fungi). Any effects considered to be from sampling gear (such as lesions from the net) were disregarded and not counted in the anomaly assessment. Percentages of samples containing affected fish were calculated using only sample efforts in which fish were caught. Percentages of affected individuals were calculated based on number of affected fish and total number of fish examined for anomalies (which was, in some cases, less than the total catch for the sample). All calculations were made as percentages since each seine region and trawl station had a different number of viable sample records, and each site can observe vastly different abundances of catch.

III. RAPID BIOASSESSMENT PROTOCOLS
(Barbour et al., 1999)

- RBPs are a functional method to characterize the presence and severity of water resource impairment and help identify the causes and sources of that impairment

Use of Fish

- Fish are good indicators of long-term effects and broad habitat conditions because they are relatively long-lived and mobile (Karr et al. 1986).
- Fish are relatively easy to collect and identify to the species level. Specimens can be sorted and identified in the field and released unharmed.
- Fish are near the top of the aquatic food web and are consumed by humans, making them important for assessing contamination.
- Aquatic life uses (water quality standards) are typically characterized in terms of fisheries. Monitoring fish provides direct evaluation of "fishability" and "fish propagation", which emphasizes the importance of fish to anglers and commercial fishermen.

Fig. 4- Site map of USFWS sampling areas in the Sacramento-San Joaquin Estuary

IV. RECOMMENDATIONS

- Continue PDELT monitoring to gain a more complete picture of fish anomalies spatially and temporally throughout the Sacramento-San Joaquin Estuary
- Examine anomaly occurrence in individual species and at individual sites
- Statistically analyze PDELT data once a larger data set is obtained
- Incorporate data into other fisheries studies to develop a more comprehensive picture of anomalies in the Sacramento-San Joaquin system
- Seek cooperation with the Fish Health Center to analyze anomalies and determine possible environmental factors
- Propose actions for further monitoring, such as water quality, to pinpoint critical areas and/or times of year to closely document fish health

Trawls

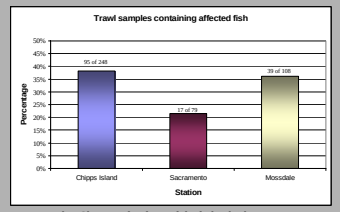


Fig. 5- The Chipps Island trawl had the highest percentage (38.5%) of samples that contained affected fish, followed by Mossdale (36%), then Sacramento, which had the least at 21.5%.

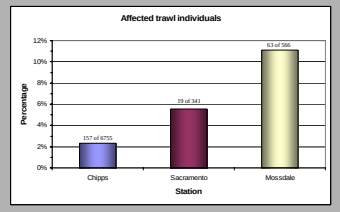


Fig. 6- The highest percentage of affected individuals (11%) was seen at Mossdale at a level twice that of Sacramento (5.5%) and over four times that of Chipps Island (2.5%).

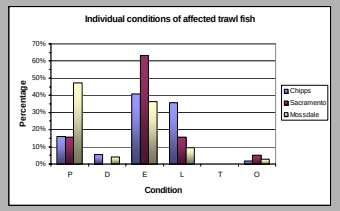
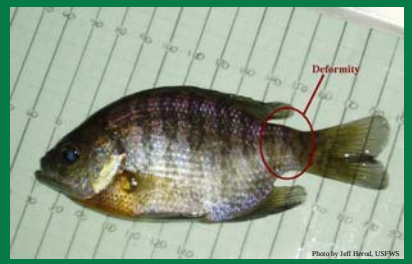


Fig. 7- Of the affected fish, Mossdale had the highest occurrence of parasites (P)- roughly 3 times that of the other stations. Fin erosion (E) was the most common anomaly overall and was the highest occurrence at Sacramento. No tumors (T) were seen at any of the stations, and a small occurrence (less than 6%) of other anomalies (O), was seen at each station.

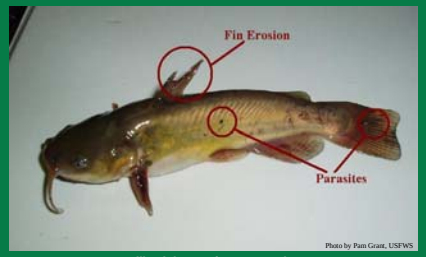


Bluegill showing a deformity. Caught at Mossdale trawl station.

V. DISCUSSION

Seine regions 5 and 6 had the smallest number of samples examined to date (10 and 12, respectively) and the percentages for affected individuals may be found to be closer to the range of regions 1-4 after further sampling (Fig. 2). The percentage of affected individuals is much higher on average for the trawl samples than for the seine samples (Figs. 2&6). This may be a reflection of the different habitat (deeper, open water vs. shallow, inshore water) sampled by the trawl gear, or a gear bias (trawl nets are much larger than seine nets). Fin erosion is the most prevalent anomaly for both sampling methods (Figs. 3&7), although, of the examined anomalies it could be the most easily misidentified (confused with tearing from predation or sampling gear) and there is considerable variation by site.

There does not seem to be a connection between the percentage of samples containing affected fish and the percentage of individuals that are affected for either the trawl or seine sampling. Chipps Island has the highest incidence of affected samples for the three trawl stations, but the lowest percentage of affected individuals, which reflects the different volumes of catch at each site (Figs. 5&6). Mossdale trawl station shows the highest percentage of affected individuals of any site or sampling method, as well as the highest prevalence of parasites (Fig. 7). The presence of such anomalies may be an acute indicator of toxicant contamination (McCarthy and Shugart *in* Steyermark et. al 1999).



Brown Bullhead showing fin erosion and parasites.
Caught at Mossdale trawl station.

VI. ACKNOWLEDGEMENTS

Thank you to the DJFMP crew and data management team for their efforts in implementing the new RBP and collecting and entering the data so they are available for all interested parties to use. Special thank you to Ken DeVore for developing the map of sample sites and to Holly Herod for overseeing the PDELT project and the development of this poster.

VII. WORKS CITED

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